AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

MARCH 1, 1956

In This Issue

Special Setup at Chevrolet Stamping Plant
Design of Chrysler Torque-Flite Transmission
Latest Transfer Machines at Ford Engine Plant
Chevrolet Brings Out Heavy-Duty Truck Line
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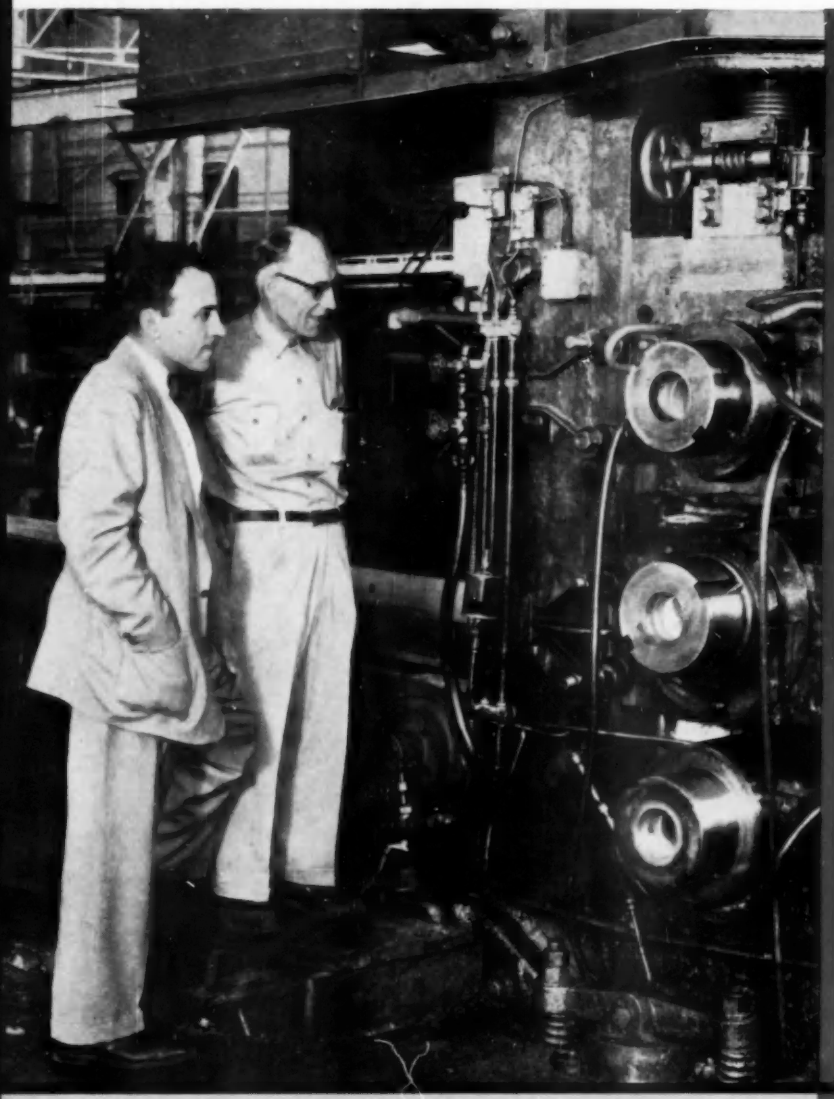
A CHILTON PUBLICATION

Sick slab roll recovers fast with application of STANOGEAR *Compound*



A slab roll at Matthiessen & Hegeler Zinc Company, La Salle, Illinois, was sick. It suffered from repeated roll neck bearing failures. Bearing temperatures couldn't be controlled. A consultant was summoned—Marshall J. Fox, Standard Oil lubrication specialist. His diagnosis and remedy: Install STANOGEAR Compound and equip the machine with a central pressure system for application. Recommendations were followed. Result: No bearing failures, due to faulty lubrication, since. Maintenance costs reduced. Time lost through breakdowns slashed.

This was a condition made to order for STANOGEAR to remedy. And Matthiessen & Hegeler knew there was a man at hand who could suggest what should be done. It's another demonstration of what this unbeatable combination can do when put to work:

1 **Standard Oil lubrication specialists capable of giving technical help.**

2 **Top quality products *that deliver results required.***

STANOGEAR Compounds contain special additives making them suitable for applications where heavy loads cause welding, seizure or scoring.

In the Midwest and Rocky Mountain states, a Standard Oil lubrication specialist in your nearby Standard Oil office will gladly give you more information about STANOGEAR. Call him. Or contact Standard Oil Company, 910 So. Michigan Avenue, Chicago 80, Ill.

Eugene Ewald (right), Mill Foreman, and Marshall Fox, Standard Oil lubrication specialist, inspect slab roll. STANOGEAR Compound helped solve lubrication problem on roll neck bearings.

Marshall Fox who proposed switch to STANOGEAR with resultant improved operation, is experienced in providing such technical service. Marsh has a Mechanical Engineering degree from Purdue to qualify him for this work. In addition, he has completed Standard's course for sales engineers. This experience and training, customers find, pay off for them.

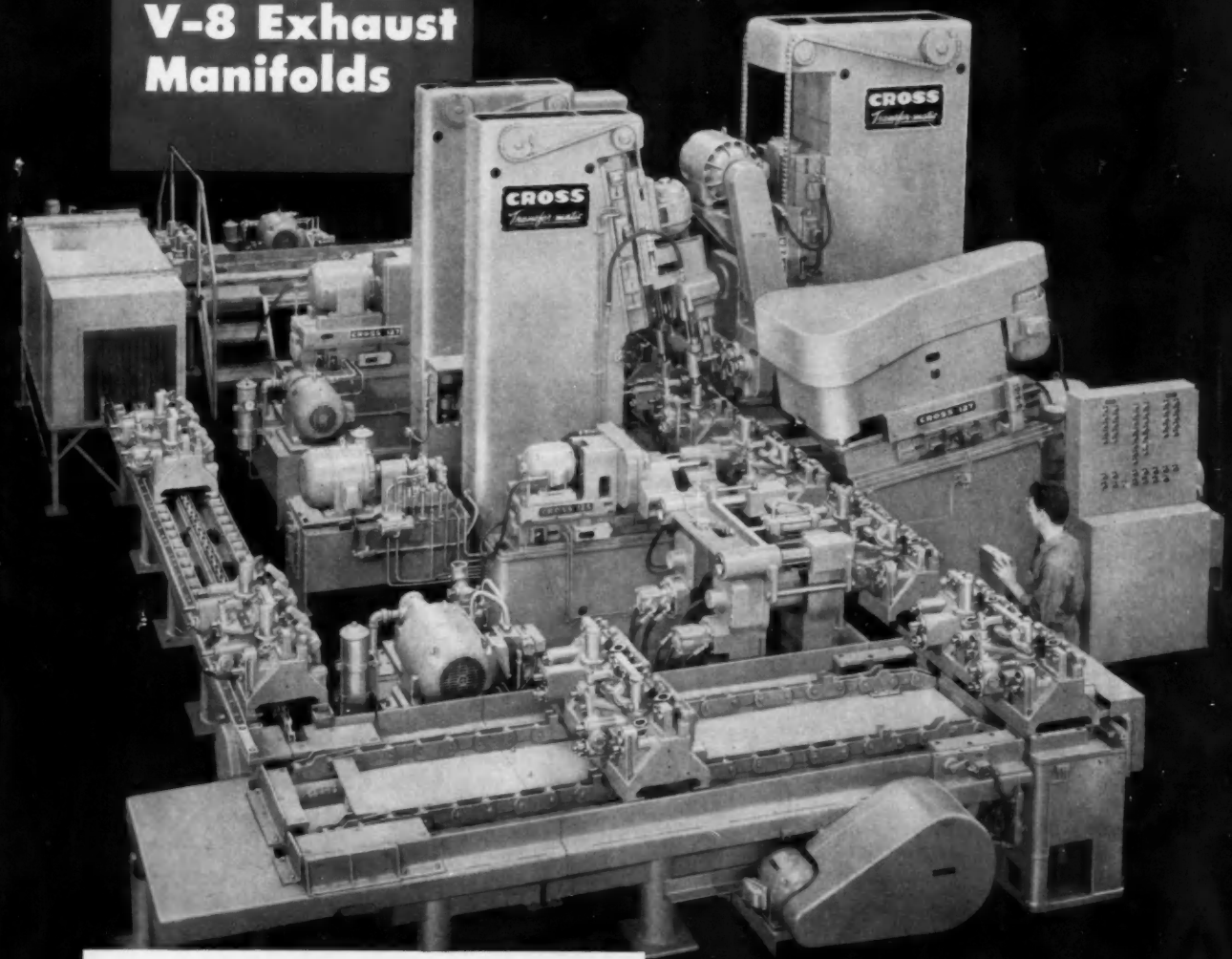
STANDARD

STANDARD OIL COMPANY

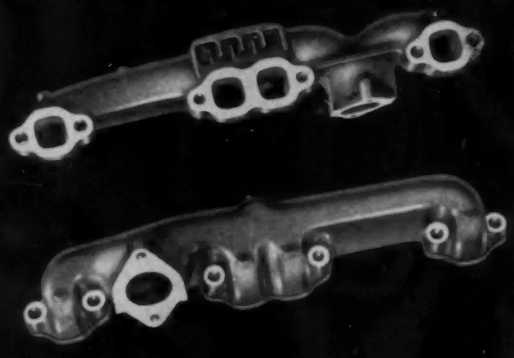
(Indiana)

Completely Machines V-8 Exhaust Manifolds

Another Transfer-matic by Cross



- ★ 51 operations: 8 milling; 37 drilling, chamfering and spotfacing; and 6 tapping.
- ★ Palletized work holding fixtures for holding one right hand and one left hand part.
- ★ Automatic power wrench for operating work holding fixtures.
- ★ Automatic transfer mechanism.
- ★ All parts in Cross machines—even tooling details—are made to interchangeable tolerances for fast, easy maintenance.
- ★ Other features: Construction to JIC standards; hardened and ground ways; hydraulic feed and rapid traverse for milling, drilling and boring; individual lead screw feed for tapping.



Established 1898

THE CROSS CO.

First in Automation

DETROIT 7, MICHIGAN

"Rhino" meets rugged demands of line maintenance work. Driving front axle and other vital parts made from nickel alloy steels. The "RHINO" is produced by The Four Wheel Drive Auto Co., Clintonville, Wisc.

How ready-made steels boost ratings

9500 POUNDS . . . that's the rating of the live front axle on this FWD "Rhino." Stronger than the usual truck axle by 50%, it safely takes stress and strain from front-mounted derrick and digger.

Built to handle work far beyond the scope of a conventional truck, FWD vehicles need extra stamina, obviously. And to obtain it, FWD's engineers specify standard grades of nickel alloy steels. Grades that show how you, too, may boost ratings.

For example, nickel-chromium-molybdenum axle shafts of 4337 and main transmission shafts of 4340 withstand shocks, fatigue and multiaxial stresses. Furthermore, these steels readily respond to fabrication and heat treatment.

Carburizing grades . . . 4820 or 4620 for transmission gears, and 4620 or 8720 for transfer case gears . . . provide the combination of strength and toughness that means hard, wear-resistant surfaces supported by strong, tough, shock-resistant cores.

For extremely high toughness and strength in differential ring gears and pinions, FWD specifies Krupp 4% nickel 1½% chromium steel.

Whatever your product, when you face questions about metal let us give you the benefit of our wide practical experience. Write for List A of available publications. It includes a simple form that makes it easy for you to outline your problem.

Driving safety boosted in new pumper series. Steering made easier, cornering improved. FWD toughens components by making them of nickel alloy steels.

Power to spare in roughest kind of going. FWD road maintenance trucks utilize nickel alloy steel parts for essential stamina as well as wear-resistance.

One-man cab unit allows 10% more cargo space. Thanks to weight-saving rear axles and scientific weight distribution. Strength gained by using nickel alloy steels permits the extra payload.

INCO TRADE MARK **THE INTERNATIONAL NICKEL COMPANY, INC.** 67 Wall Street New York 5, N. Y.

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE — PUBLISHED SEMI-MONTHLY

MARCH 1, 1956 — VOL. 114, NO. 5

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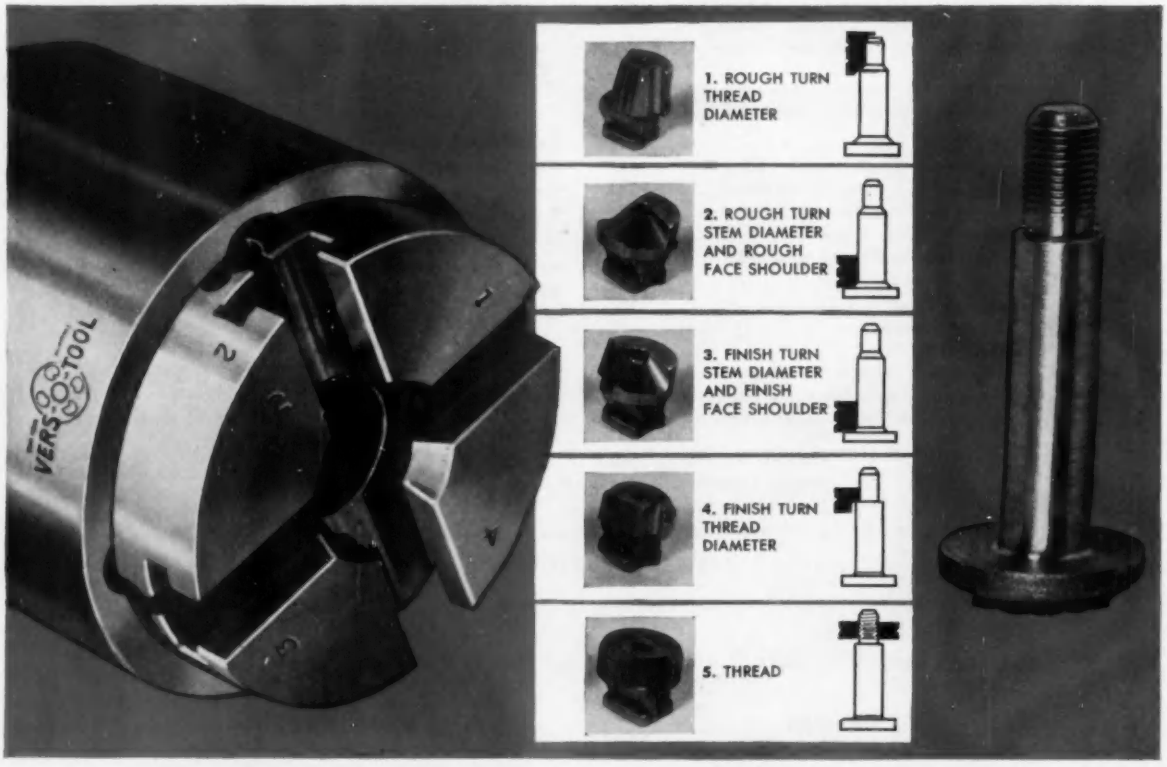
HERE'S HOW NAMCO VERS-O-TOOL

CUTS COSTS... SPEEDS PRODUCTION ON END TURNING AND FORMING

In this application 300 lever supports an hour are turned out on a vertical six-spindle automatic. Vers-O-Tool machines these steel forgings three times faster than single point tools, opens at the end of the cut, leaves no spiral marks on the work.


VERS-O-TOOL
1. ROUGH TURN THREAD DIAMETER
2. ROUGH TURN STEM DIAMETER AND ROUGH FACE SHOULDER
3. FINISH TURN STEM DIAMETER AND FINISH FACE SHOULDER
4. FINISH TURN THREAD DIAMETER
5. THREAD

Vers-O-Tool licks tough production problems because:

1 Basic Vers-O-Tool design permits cutters or ground thread chasers to be changed quickly without adjustment in the head.

2 All settings in the blocks are made in the tool-room with a micrometer gauge—no need for trial and error run after changing or grinding.

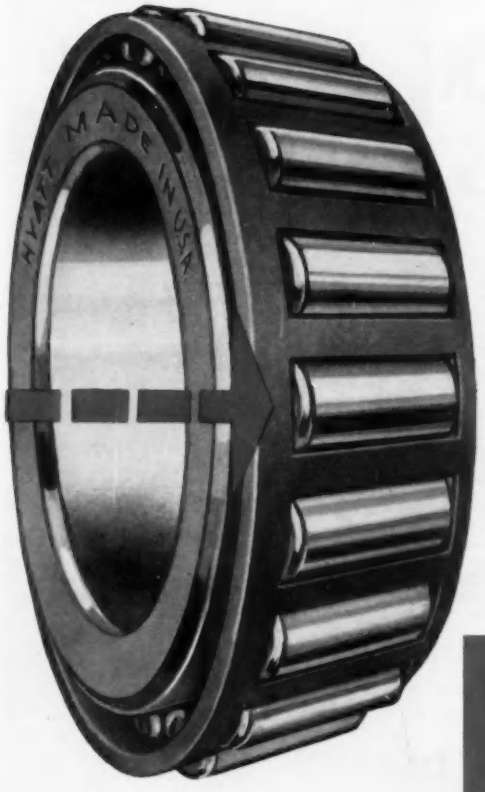
SEND FOR THIS CATALOG DT-52

the National Acme company

173 EAST 131ST STREET • CLEVELAND 8, OHIO

Q. Does HYATT supply taper bearings, too?

A. Do they! Nearly half of all automobiles built today are equipped with HYATT taper roller bearings!



Surprised? It's a fact—HYATT makes *millions* of fine taper roller bearings every year. And every last one measures up to the traditional HYATT standards of precision and dependability you've learned to expect from America's *first* and *foremost* builder of roller bearings. Yes, in *tapers*, too, HYATT means *highest quality!* Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

GM GENERAL MOTORS

HYATT

STRAIGHT BARREL TAPER

WHAT	WHERE	WHY
SUNVIS 900	**In tight systems** where oil is rarely changed and little or no make-up is needed.	**Exceptionally long life** of oil keeps overall costs low.
SOLNUS	**In tight systems** where make-up oil is less than 5% per month.	**Moderately priced**...excellent stability and rust protection.
SUNTAC	**In leaky systems** where make-up average is 5% or over per month.	**Reduced leakage** in systems cuts oil costs and downtime.
CIRCO	**In systems** where oil is continuously diluted by water, cutting fluids and other contaminants.	**Low-priced**...excellent protection where oil must be changed frequently.
SUNVIS H.D. 700	**In systems contaminated** by dust and deposits of sludge, varnish, etc.	**Cleansing action** removes deposits and eliminates costly teardowns.
LUBEWAY	**In dual purpose systems** of machine tools where hydraulic oil is also a way lubricant.	**Added film strength** of this hydraulic oil also eliminates "stick-slip" on ways.

CHART SHOWS WHERE AND WHY SUN HYDRAULIC OILS SAVE MONEY

As the chart shows, to operate your hydraulic system at maximum efficiency and minimum cost you must consider the condition of your hydraulic system, as well as pressures, operating temperatures and other usual factors.

And, very important, you must consider the age of your system. Continued use of original oil recommendations can be costly. A change in the type of oil can often result in substantial savings...especially where systems have developed leaks or where sludge and varnish cause excessive maintenance.

For complete information about how Sun hydraulic oils can help you cut operating costs of your hydraulic system, see your Sun representative...or write SUN OIL COMPANY, Philadelphia 3, Pa. Dept. AA-3.

SUNOCO®

INDUSTRIAL PRODUCTS DEPARTMENT

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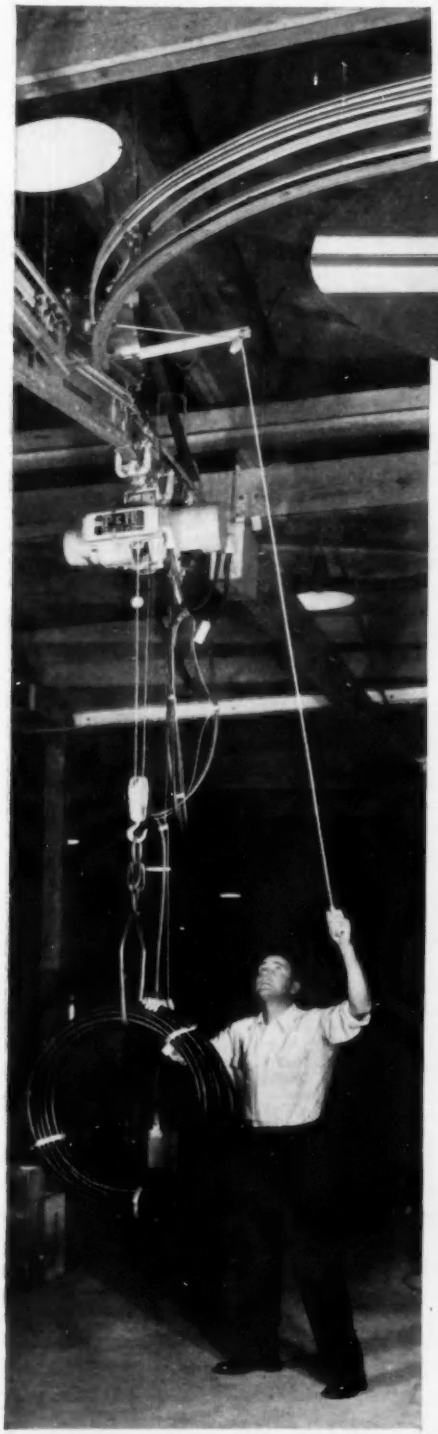
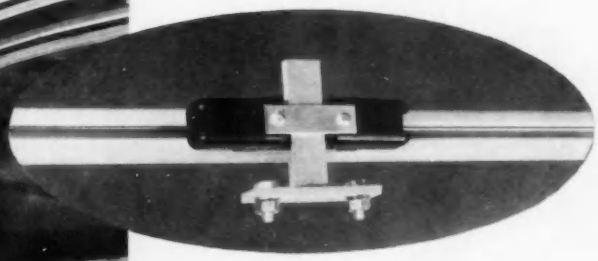
Another new development using

B. F. Goodrich Chemical *raw materials*



B. F. Goodrich Chemical Company does not manufacture this extrusion. We supply only the Geon rigid vinyl materials.



Rigid Geon packs power in small space

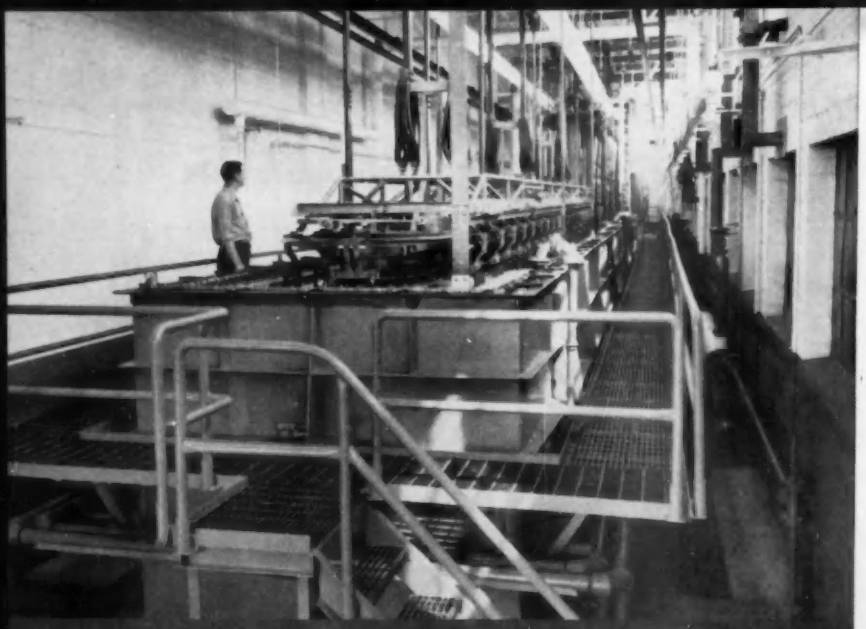
NAKED wires on an overhead power lift are a hazard, lose power along the line and have to be spaced widely where multiple electrical contacts are needed in large plants. As a product improvement, a manufacturer has designed U-shaped extruded insulation made of Geon rigid vinyl that has many advantages for the job.

The rigid vinyl extrusion carries a metal contact conductor safely so that as many as three to twelve power lines can be installed close together where space is tight. Because this insulation is made of Geon rigid vinyl it has high dielectric strength, high insulation resistance with low power loss. It has good chemical and abrasion resistance, necessary for long life in industrial plants and it can be colored according to local code requirements.

This installation you see here is a good example of a new use for Geon rigid vinyl. It may suggest a new use to you or may give you an idea for another saleable product. There are scores of other uses for Geon materials from rigid sheeting to rigid pipe and fittings. For technical help in the uses of versatile Geon please write Dept. DA-2, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable.

GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors



MAINTAINING THE PACE OF MASS PRODUCTION

This Udylite Machine Cleans, Plates and Processes 480 Auto Grilles per hour AUTOMATICALLY

A complete production operation—applying nickel-chrome plate to steel radiator grilles—is handled by three men and this Udylite machine. The entire operation of cleaning, plating and rack strip are handled by the machine—the loading and unloading of parts are the only manual operations. The stampings are approximately 8″ x 36″ in size and to assure them of a flawless finish Udylite installed a Horizontal Cathode Agitator. In addition, a high current density chrome strike is applied before the chrome plate.

This is just one more example of how Udylite machines are meeting the pace of mass production. And Udylite machines are adaptable to practically any metal finishing operation you can name. Why don't you find out more about how Udylite can fit into your operations? Just call your nearby Udylite representative or write direct for the full details. There's no obligation.

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

WORLD'S LARGEST PLATING SUPPLIER

CALENDAR

OF COMING SHOWS AND MEETINGS

SAE National Passenger Car, Body, and Materials Meeting, Hotel Statler, Detroit, Mich. .....Mar. 6-8
Geneva Automobile Show .....Mar. 8-18
Vienna Automobile Show ....March 11-18
National Association of Corrosion Engineers, annual convention, Hotel Statler, New York, N. Y. Mar. 12-16
Pressed Metal Institute, spring technical meeting, Hotel Carter, Cleveland, O. .....March 14-16
Association of National Advertisers, spring meeting, Homestead, Hot Springs, Va. .....Mar. 14-16
American Institute of Industrial Engineers, Conference on Automatic Controls, Cleveland, O. Mar. 15-16
Stockholm Automobile Show March 16-25
SAE National Production Meeting and Forum, Hotel Statler, Cleveland, O. .....Mar. 19-21
ASTE Industrial Exposition, International Amphitheatre, Chicago, Ill. .....Mar. 19-23
AMA Special Manufacturing Conference, Hotel Statler, New York, N. Y. ..... March 26-28
ASLE Annual Meeting, William Penn Hotel, Pittsburgh, Pa. April 4-6
American Chemical Society, national meeting, Statler-Hilton Hotel, Dallas, Tex. .....April 8-13
SAE Aeronautic Meeting and Production Forum and Aircraft Engineering Display, Hotel Statler, New York, N. Y...April 9-12
National Packaging Exposition, Convention Hall, Atlantic City, N. J. .....April 9-12
MPA Annual Meeting and Metal Powder Show, Hotel Cleveland, Cleveland, O. .....April 10-12
National Industrial Research Conference, Sherman Hotel, Chicago, Ill. .....April 18-19
National Petroleum Institute, semi-annual meeting, Cleveland Hotel, Cleveland, O. .....April 18-20
Turin Motor Show, Italy..April 21-May 2
American Zinc Institute, annual meeting, Hotel Statler, St. Louis, Mo. .....April 23-24
British Industries Fair, London and Birmingham, England April 23-May 4
International Automobile Show, Coliseum, New York, N. Y. April 28-May 6
AFS Castings Congress and Show, Atlantic City, N. J. .....May 3-9
AWS Spring Meeting and Fourth Welding & Allied Industry Exposition, Buffalo, N. Y.....May 8-11
Western Material Handling Conference and Equipment Show, Los Angeles, Calif. .....May 9-11
Mechanical Handling Exhibition and Convention, Earls Court, London, England .....May 9-19
Design Engineering Show, Convention Hall, Philadelphia, Pa..May 14-17
Indianapolis 500-Mile Race .....May 30
AGMA Annual Meeting, Homestead, Hot Springs, Va. .....June 3-6
SAE Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. .....June 3-8
Material Handling Institute 1956 Exposition, Public Auditorium, Cleveland, O. .....June 5-8
Seventh National Plastics Exposition, Coliseum, New York, N. Y. June 11-15

Printing electronic resistors at Barry Process Company, Brooklyn, New York, with Denison hydraulic Multipress and special patented head.

Cost-saving idea from **DENISON**

Triples production of printing electronic resistors

ELECTRONIC circuits are printed three times as fast with the Denison hydraulic Multipress®.

Uniformity of carbon ink deposits holds tolerances within 6% on resistors ranging from 100 ohms to 2 megohms.

Critical timing and pressure control, essential for precise duplication of ink deposits, are easily attained with the Denison split-second time-hold delay and precision controlled pressure on the hydraulic ram.

Exceptionally fast set-up of die platens enables efficient handling of a wide range of work with minimum of setup, for low-cost production of many types of printed electronic circuits.

Have the Denison representative give you more cost-saving details. He can also show you how to save money on jobs like swaging, staking, riveting, deep drawing and assembling. Write us.

THE DENISON ENGINEERING COMPANY
1212 Dublin Road, Columbus 16, Ohio
A Subsidiary of American Brake Shoe Co.

DENISON HydrOILics

HYDRAULIC PRESSES • PUMPS
MOTORS • CONTROLS

Bendix Products Division

A good reliable source

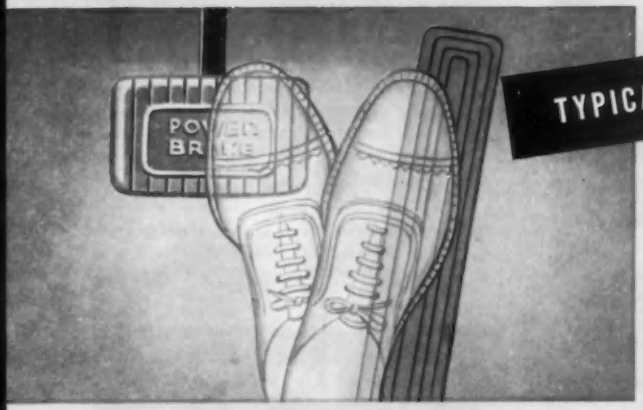
FOR AUTOMOTIVE COMPONENTS

Because of long experience, serving many customers,

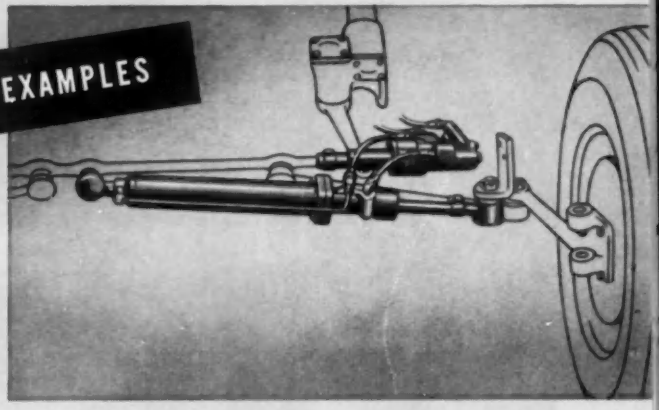
Bendix Products Division can apply much of the combined know-how of the automotive industry

to any specific project in the design and manufacture of automotive components.

TYPICAL EXAMPLES



BENDIX LOW PEDAL POWER BRAKE—Specified by more car manufacturers than any other make, Bendix* Low Pedal Power Brake makes possible quick, sure stops by merely pivoting the foot from the go to the stop control. No need to lift the foot and exert leg power to bring the car to a stop. Result—more driving comfort, less fatigue and greater safety!



BENDIX LINKAGE TYPE POWER STEERING—Because Bendix* Power Steering is of the linkage type, manufacturers find it especially adaptable for production line installation without extensive engineering changes. Manufacturers can now meet the ever-increasing demand for power steering more efficiently and more economically with Bendix Linkage Type Power Steering.

*REG. U.S. PAT. OFF.

BRAKES • POWER STEERING • POWER BRAKING • CONSTANT VELOCITY UNIVERSAL JOINTS • HYDRAULIC REMOTE CONTROLS

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High Spots of This Issue

Transfer Machines in Ford Cleveland Engine Plant

Continuing a previous survey of automation equipment to be found at Cleveland Engine Plant No. 2, the author devotes direct attention here to the transfer machines. Their design and operational features are described. See Page 28.

Special Setup of Presses for Fender, Hood Production

This second article on the new Chevrolet Frame and Stamping Plant at Flint, Mich., is devoted to the manufacture of fenders and hoods in the stamping section. Extensive materials handling facilities speed all steps in the work. Page 34.

Extruded Rivet Process for Drop-Center Wheels

In answer to the need created by tubeless tires for leakproof wheels, Budd Co. has developed an extruded rivet process for joining the rim to the wheel disk that meets this requirement. The technique is fully detailed here. Page 44.

New Uses for Plastics Discussed at SPI Meeting

The phenomenal growth of the industry was vividly emphasized last month at the Annual Conference and Exhibit of the Reinforced Plastics Div. of the Society of the Plastics Industry. New developments in the field are given attention. Page 53.

Preview of the 1956 Exposition of the ASTE

Opening in Chicago later this month, the 24th Annual ASTE Convention and Show is expected to attract 40,000 registrants and 500 exhibitors. Presented in this issue is an advance survey of new equipment to be exhibited. Page 54.

41 New Product Items And Other High Spots, Such As:

Chevrolet heavy-duty trucks; Torque-Flite transmission; balancing torus assemblies; making automobile wheels; plating automation; Czechoslovak vehicles; Fuller transmission; wheel balancing; and induction heating equipment.

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AUTOMOTIVE INDUSTRIES COVERS
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AVIATION CORPORATION

News of the AUTOMOTIVE

FWD TRACTOR HAS AIRCOOLED DEUTZ DIESEL ENGINE

This new Four Wheel Drive Auto Co. transport tractor is powered by an aircooled, eight-cylinder Deutz F8L614 Diesel engine with an output of 170 bhp at 2300 rpm and a maximum torque of 447 lb ft at 1200 rpm; bore is 4⅜ in.; stroke, 5.5 in.; piston displacement, 649.2 cu in.; and compression ratio, 17.8 to 1. Coupled with a five-speed transmission, the power plant utilizes indirect fuel injection with swirl chamber. Model T-6414D tractor has a front axle weight of 6722 lb and rear axle weight of 5905 lb.

Borg-Warner Transmission Adopted for Heavy Trucks

Borg-Warner's Ford-O-Matic type transmission has been adopted as optional equipment by one of the major heavy-duty truck builders. This type of drive is built by Warner Gear and the B-W automatic transmission plant in Decatur, Ill.

It is also reported that Borg-Warner has developed an eight-speed automatic transmission for heavy-duty trucks. This is being tested currently by a large heavy-duty truck builder.

Ford Arizona Proving Ground Has Array of Test Facilities

Ford has completed the second of its planned three major proving grounds with the dedication of its large facility at Kingman, Ariz. The 3840-acre Arizona test facility and the 360-acre Dearborn test area will be supplemented late this year by Ford's new 3880-acre proving ground at Romeo, Mich.

In addition, the company operates a test station at Jennerstown, Pa., for testing durability, brakes, and transmissions, about 150 miles of public roads in the hilly area are utilized. Ford also plans to establish a Pike's Peak testing facility this summer for high-altitude operations and for testing carburetor performance.

The Arizona site was selected because of its consistently adverse climatic conditions of extreme heat, low humidity, and heavy concentrations of abrasive dust. In addition to facilities for testing vehicles under such conditions, the nearby Black Mountains provide long and steep rocky grades.

The Kingman proving ground is of generally flat terrain with 26 miles of test roads. The 36-ft, five-mile high-speed track has a design speed of 140 mph and a maximum usable speed of 160 mph.

Former runways and taxiing strips of an abandoned military air base, which forms part of the proving ground, make up 3½ miles of durability roads. An additional 16 miles of gravel roads are also provided for durability tests.

Ford plans to run about 12.4 million miles of testing on both its own and competitors' vehicles this year; about 65 per cent at the Romeo proving ground. Both production and experimental cars of its own divisions as well as component parts produced by the company and its suppliers, will be tested.

New Manufacturing Group Established By Chrysler

Chrysler Corp. has formed a new manufacturing group which will embrace 10 of the company's major components producers previously operated by either a car division or the Supply Div. To be called the Engine and Transmission Group, it will be composed of three divisions—the Forge and Foundry Div., the Axle and Transmission Div., and the Engine Div.

Under the new setup, the Forge and Foundry Div. will be made up of the Dodge Forge plant and Winfield Foundry in Detroit and the New Castle, Ind., Forge plant; the Engine Div. will operate the Mound Rd. Engine plant; and the Axle and Transmission Div. will consist of the three transmission plants in Indiana and the machining unit at New Castle, Ind., the Lynch Rd. Plant in Detroit, and the Detroit Universal Div.

Decline In New Car Inventories Foreseen As Spring Season Nears

Stocks of new cars, which have remained around the record 800,000 mark since the beginning of the year, should start declining in the next couple of months. Automobile manufacturers again are looking for the traditional sales upsurge which generally occurs with the start of spring.

None are alarmed over the heavy stocks in dealers' hands at present, which rose slightly in February over January's total, despite sharp cutbacks in production by many companies. The present slower sales rate cannot really be considered as an indicator for the coming months.

The industry's present rate of production is about 13 per cent under that of last year. At press time, several makers were trimming output to bring stocks in line with the present market demand. Among them was Ford, which closed 10 of its 15 plants for one and two-day periods, idling nearly 20,000 hourly workers, while Chrysler furloughed more than 4000. Chrysler's total work force has been reduced by about 24 per cent since mid-December, when the corporation started cutting back.

AND AVIATION INDUSTRIES

GE Development Facilities For Jet Propulsion Viewed

General Electric Co. last month held the first major showing of its large aircraft gas turbine development facilities at the GE jet engine plant near Cincinnati, O. (See AI, May 1, 1953, p. 68.) Included in the facilities is equipment for testing nearly all types of jet engine parts and components; for developing advanced fuels, alloy metals, and other materials such as plastics; and for high-speed mathematical calculations.

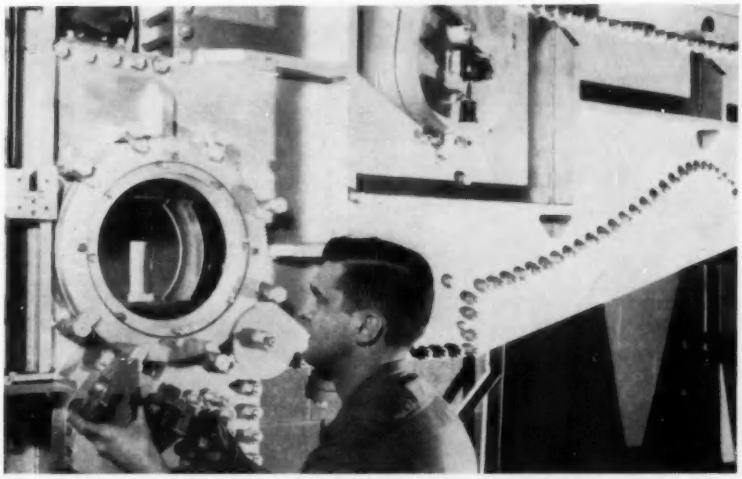
Highlights of Displays

Representatives of the Armed Forces, the aircraft industry, and the press, in addition to numerous civic officials who attended the showing of the multi-million dollar facilities, viewed a wide variety of interesting exhibits.

Unveiled for the visitors was a new display of a half-sized rocket engine similar to that which GE will build for the Government's satellite rocket. Measuring 31 in. long and 10 in. in diameter, the model is a cutaway which shows internal parts, including the thrust chamber, propellant pumps and pump drive system, and regenerative cooling system.

Built at a cost of $650,000, the new computation building at the GE jet engine plant contains in its 27,000 sq ft of floor space the latest IBM equipment for solving complex problems involved in power plant development. By the same token, the new Propellants Development Laboratory is also outfitted with the latest electronic equipment for recording test results. Two test stands are available, wherein air can be supplied at rates up to 50 lb per second at pressures ranging from 300 psi and temperatures to 1200 F.

In connection with the showing of the Materiels Laboratory, the results of an experimental program using plastic compressor blades in place of conventional steel ones in a GE jet engine were announced. Composed of a reinforced phenolic resin, the plastic blades were said to have shown excellent erosion resistance, to be capable of operating continuously between 450 and 500 F, and to have good stress characteristics.



This new supersonic wind tunnel with the ability to provide Mach 2.5 speeds has been installed at the GE Development laboratory in Evendale, O. The tunnel, through which air rushes at 1800 mph, can operate at up to 400 F at 120 psi maximum tunnel inlet operating conditions, as well as at low pressure conditions simulating altitude.

Other Facilities Planned

While introducing its present development facilities to the visitors, GE disclosed that it will make important additions to them in the near future. At the top of the list of projects is a $20 million test facility that will be capable of simulating supersonic flight conditions for jet engines three times more powerful than any currently in production.

Expected to be completed in early 1958, the supersonic test facility will include two altitude test cells with diameters of 18 ft each in which engines under test will be housed. The entire unit will require a 100-man crew and will use more than 80,000 kw.

The company also revealed that it is building a special $150,000 brazing facility for fabricating lightweight jet engine structures. A honeycomb sandwich material for jet engine components will be produced at the facility utilizing alloys and brazing techniques developed by GE.

Erratum

In the article entitled "Advances in Aircraft Hydraulic Equipment" (see AI, Dec. 1, p. 69), the figure of 4000 psi was omitted from the final line that should have been carried over to page 112.

Mercury Medalist Series Grows Easing Price Path for New Car

Addition of two more models to Mercury's lowest-priced Medalist series of cars marks another step by Ford Motor Co. to fit its forthcoming new automobile line price-wise between the Lincoln and Mercury lines. The new line will be introduced in the latter part of 1957 as a 1958 model.

The company's decision to add more models in the Medalist series does not necessarily mean that Mercury will drop any of its other models. There is, however, a possibility that the highest-priced custom series might be discontinued to permit a wider price gap between Mercury and Lincoln.

Until now, Mercury has offered only a two-door sedan in the medalist series, which has less chrome and other ornamentation, but the same mechanical features as the higher-priced models. The two additional models in the Medalist series are a two-door hardtop and a four-door sedan.

Another move preparatory to bringing out the new line is the naming of the Foote, Cone and Belding agency to handle the advertising for the Special Products Div., which is planning the new car.

News of the AUTOMOTIVE

PEGASO CAR FEATURES STYLISH ITALIAN BODY

The Spanish Pegaso two-three seat Z-103 coupe has an Italian Superleggera body. Power plant is a light-alloy V-8 engine with a stroke of 3.23 in. and a bore of either 3.43 in. (238 cu in.) or 3.66 in. (271 cu in.). Compression ratio is either 8 or 9 to 1. Output of the large engine is 300 bhp at 5800 rpm, the manufacturer states.

P. R. Mallory May Acquire Cleveland Battery Concern

General Dry Batteries, Inc., Cleveland, will become a division of P. R. Mallory & Co., Indianapolis, if plans to merge the two firms are approved by shareholders. P. R. Mallory would acquire the battery company through an exchange of stock.

Many Changes Are Incorporated In New Improved GM Contracts

Broad changes have been made by General Motors in its selling agreements to mark another effort by GM to strengthen its relationships with its dealers. Among the major changes is a provision for a referee to rule on disputes between the company and dealers, a choice of three new franchises, and a plan under which GM will assume a number of costs previously borne by the dealer. The plan now provides choice of an "indefinite term" contract, a five-year contract, or the present one-year pact.

The referee, who will replace the present Dealer Relations Board, will be chosen "on the basis of special qualifications and experience." GM did not elaborate on that aspect. The present Dealer Relations Board consists of top GM executives.

GM now will assume the full cost of warranty adjustments and direct mail costs; grant larger allowances on all new cars in stock preceding the announcement of new models; double the allowance under its parts obsolescence plan; and increase to 90 days from 30 the period within which purchased parts may be returned to the factory. GM will likewise provide assistance and substantial protection for the dealer in disposing of his premises and leaseholds in the event of contract termination.

The corporation also will extend its policy under which a son-in-law may succeed to the dealership in event of death or incapacity of the dealer. It will also make it possible for a dealer to provide that his widow have a financial interest in the dealership for five years after his death.

While the aforementioned are among the more important changes in the new contracts, which become effective this month, a score of other alterations are also included, such as: a provision for evaluating the dealer's sales performance based on many factors; an increase in factory contributions to cooperative advertising funds; a clause providing for maintenance of high standards of ethics in local dealer advertising; and broader provisions for repurchasing parts and special tools when the dealer's contract is terminated. Costs for sales contests conducted by the dealer and magazines distributed to car owners now will be shared equally by the corporation and the dealer.

The one- and five-year agreements can be cancelled by the company only for cause. They can, however, be terminated by the dealer without cause on 30 days' notice. The "indefinite term" contract can be ended by GM on 90 days' notice without cause and by the dealer on 30 days' notice without cause.

The agreements constituted the second dealer benefit to come out of the dealer council meetings held early last month. GM had previously announced a new group life insurance plan which provides up to $100,000 in coverage for an individual dealer.

Largest Chevrolet Plant To Be Erected in Spring

Construction is scheduled to start this spring on the largest Chevrolet assembly plant ever to be built by the division. To be located on a 300-acre site about 12 miles northwest of Youngstown, O., the new plant will have 2.5 million sq ft of space for both Chevrolet and Fisher Body operations.

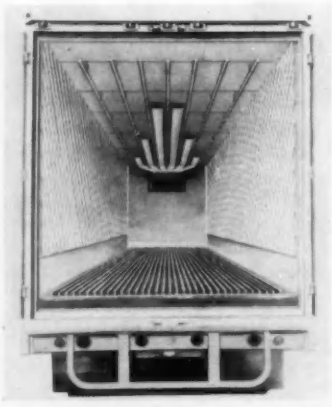
The plant will not only be the largest in physical size but also in employment and production capacity. Chevrolet's largest plant at present is the 1.6 million sq ft facility in St. Louis, Mo.

When completed in 1957, the new plant will employ in the neighborhood of 8000 salaried and hourly workers. It will bring to 13 the number of assembly plants operated by Chevrolet.

Ford 1955 Payroll Climbed To a Record $1.117 Billion

Overtime schedules necessitated by high automobile production last year brought Ford Motor Co.'s 1955 payroll to a record $1.117 billion. Hourly employes worked an average of 44.2 hours a week and were paid an average of $106.68.

AND AVIATION INDUSTRIES



MOISTURE-PROOF REEFER

Interior view of new Fruehauf refrigerator Volume Van shows installation of new HaskoStruct insulation that is said to reduce heat loss while providing greater volume, less weight, and no moisture absorption. Developed by Haskelite Manufacturing Corp., it consists of a polyester plastic-impregnated cloth of glass fibers over a rigid backing of aluminum sheeting on hardwood plywood. This, in turn, is bonded to a thick layer of Styrofoam.

Chrysler Sales Hit Record; Net Third Best In History

Net earnings of Chrysler Corp. last year topped the $100 million mark, more than five times above 1954 profits. While the net was the third best on record, topped by $132 million in 1949 and $127 million in 1950, Chrysler hit peaks in a number of other categories. For example, sales soared to $3.4 billion or more than 67 per cent ahead of 1954.

The number of cars and trucks sold by Chrysler last year climbed to an all-time high of 1,579,215, nearly 79 per cent above 1954. Passenger cars accounted for 17.1 per cent of the total industry market or about three per cent shy of the corporation's projected goal of 20 per cent. Chrysler's market penetration, nonetheless, was encouraging when compared with that of the previous year when it totaled slightly above 13 per cent.

Sales of military products dropped to $195 million from $290 million in the preceding year. They accounted for only 5.6 per cent of total sales, against 14 per cent in 1954.

AI TABLOID

Directors of Piasecki Helicopter Corp. have recommended to shareholders that the name of the company be changed to Vertol Aircraft Corp.

* * *

Cleveland Pneumatic Tool Co. has taken over the business of National Water Lift Co. . . . McNeil Machine & Engineering Co. has acquired Hamlin Metal Products Co.

* * *

General Electric Co.'s T58 small gas turbine engine is in advanced stages of development for the Navy and is rated in the 1000-hp class.

* * *

Ford Motor Co. has set up a separate Canadian, International and Tractor Styling Studio.

* * *

Ateenate, Inc., has announced development of a process for permanently coating and integrally marking the surface of stainless steel. . . . Canadian Steel Improvement has developed a new titanium forging process.

* * *

Morse Chain Co. has acquired Eberhart-Denver Co. and the affiliated Spreco Co.

* * *

Solar Aircraft Co. has announced construction of a new engineering test laboratory for research in gas turbine engines. . . . Marquardt Aircraft Co. will build a ram-jet engine plant near Ogden, Utah, a test plant near Great Salt Lake, and will expand its Van Nuys, Calif., plant.

* * *

Soreng Products Corp. and A-P Controls Corp. have merged to form Controls Corp. of America.

* * *

Resistoflex Corp. has occupied a new plant and research facility at Roseland, N. J. . . . Palnut Co. has moved to a new plant at Mountainside, N. J.

Pullman, Inc., has signed a license agreement with Phillips Petroleum Co. to produce new types of polyolefin plastics.

* * *

Boeing Airplane Co. has announced a $29.5 million expansion program that includes a new $21 million Development Center at its main plant in Seattle, Wash., and an $8.5 million manufacturing and office facility at Renton, Wash.

* * *

Lockheed Aircraft Corp. will move its Missiles Div. to Sunnyvale, Calif. . . . United Aircraft Products, Inc., has moved its West Coast activities to new quarters at 1101 Chestnut St., Burbank, Calif.

* * *

General Electric Co. has announced plans to establish headquarters in San Jose, Calif., for its Atomic Power Equipment Dept.

* * *

All-State Engineering Co. has moved into a new Milwaukee plant.

* * *

Ryan Aeronautical Co. has received contracts exceeding $4 million for an additional quantity of Firebee drone missiles.

* * *

Ford Motor Co. has disclosed plans to produce bumpers at its Monroe, Mich., parts plant. Output is expected to start in the summer of 1957.

* * *

Temco Aircraft Corp. is organizing a nation-wide distributor organization to handle sales and service of its Riley Twin.

* * *

Selas Corp. of America has moved from its former Philadelphia site to a new $1 million plant at Dresher, Pa.

* * *

Radioplane Co. has developed a radio-controlled pilotless aircraft constructed of plastic.

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Ford Expansion Programs Abroad Hit $500 Million

Ford Motor Co. affiliates in countries outside of the U. S. will have invested more than $500 million in new plants, production facilities, and tooling between the end of World War II and the completion of overseas expansion programs now underway.

The figure, which includes work completed or planned, is in addition to the $3.75 million postwar modernization, tooling, and expansion program in the U. S. Thus, the world-wide program for new production facilities and tooling by the company and its overseas affiliates since the end of World War II totals $4.25 billion.

The latest Ford statement includes an announcement of completely new expansion and facilities programs to be undertaken by Ford affiliates in The Netherlands, Belgium. Denmark, and Sweden at a total cost of $7.375 million. Of this sum, $4.37 million will be spent in The Netherlands; $1.180 million in Belgium; $1.625 in Denmark, and $200,000 in Sweden.

Eight-Ton Amphibious Vehicle Developed for OTAC by GMC

The Detroit Ordnance Tank-Automotive Command has announced development of a new Army eight-ton amphibious vehicle that is said to be capable of carrying cargo in excess of its weight. Called the "Drake," the vehicle has eight retractable wheels, plastic hardtop cab, automatic tire inflation system, propeller steering, and an automatic transmission. It was built for OTAC by GMC Truck & Coach Div. of General Motors Corp.

SAE Passenger Car Meeting To Have Futuristic Aspects

Necessary compromises in the engineering of motor vehicles of tomorrow to suit the needs and tastes of the populace of today will be among the important topics of interest to be studied at the forthcoming SAE National Passenger Car, Body and Materials Meeting. The meeting will be held from March 6 to 8 at the Hotel Statler in Detroit.

STAINLESS ON TALGO

Welder at ACF Industries plant in Berwick, Pa., joins structural members on the "Jet Rocket" Talgo train made for the Rock Island Railroad. Side panels are made of Allegheny Ludlum stainless steel for strength and ease of maintenance.

Technical papers scheduled for presentation cover such other subjects as gas turbine development, progress in motor truck design, materials for automatic transmissions and body trim, new developments in brakes, and noise suppression.

Chrysler Allows Dealers To Use Division Names

The latest company to make a minor revision in its contracts with dealers is Chrysler Corp. Under the new agreement, the name, or names, of the car division with which the dealer has a contract can be included in the dealer's corporate, firm, or trade name.

In the past, Chrysler Corp. did not allow a dealer to use a division's name in conjuction with his own name. General Motors and Ford, as well as the independents, have allowed a dealer to use division names.

Changes in the Chrysler Corp. contracts also call for a division to pay up to 75 per cent of the monthly rental on a dealer's premise for one year in the event the dealer dies or his contract is terminated. Another proviso permits a dealer's son or son-in-law to carry on the business.

Eaton Mfg. Co. Takes Over Automotive Gear Works, Inc.

Eaton Manufacturing Co. has acquired Automotive Gear Works, Inc., of Richmond, Ind., through an exchange of stock. The latter, which will be operated as a subsidiary of Eaton, produces a line of gears under the trade name of Double Diamond for farm equipment and general industrial applications; only about 10 per cent of its output goes to the automobile industry.

Merger of American Bantam With Parts Maker Approved

American Bantam Car Co., one-time manufacturer of small automobiles, will merge with Pressed Metals of America, Inc., Detroit automobile parts maker. Stockholders of American Bantam last month approved sale of the company's buildings and property in Butler, Pa., to Armco Steel Corp. for a reported $325,000. Pressed Metals will absorb all other remaining Bantam assets.

Legal Snag Might Delay Start On New Ford Plant

Indianapolis property owners in the area where Ford plans to build a multi-million dollar steering gear and cold heading plant have filed a suit protesting that the area was rezoned illegally. The residents charge that a civic commission, which rezoned the area from agriculture to industrial, had no authority to do so because it was abolished by state law which created a new Metropolitan Plan Commission.

Legal status of the new commission is being contested in the courts. It was not indicated whether the legal issue might delay construction work on the plant which is scheduled to start this month.

Estimated to cost more than $40 million, the 1.3 million sq ft plant will manufacture steering gears and other parts for Ford cars and trucks. Part of the plant will be used for cold forming operations, which will produce six million small parts daily.

Free INFORMATION SERVICE

Use either of these postcards for Free Literature listed below, or for more information on New Production Equipment and New Products described in this issue.

USE THIS POSTCARD

FREE LITERATURE

Eddy-Current Brakes 1

Dynamatic eddy-current brakes for industrial application, available in a wide range of torque capacities and operating speeds, are described in 11-page bulletin BR2. *Dynamatic Div., Eaton Manufacturing Co.*

Copper Alloy Rod 2

A new 28-page engineering manual containing complete information on copper base alloys in rod form has just been released by the *Mueller Brass Co.*

Extrusion Items 3

New extrusion items, including seamless beryllium copper tubing in redraw sizes, and new extruded shapes, are offered in the revised edition of a 20-page product directory now available from *Beryllium Corp.*

Pan Type Conveyors 4

Series 32 pan type conveyors are described and illustrated in a new booklet. Balanced type features operation through a system of counterbalances at the ends of the rocker arms and the use of rear drive construction. *Simplicity Engineering Co.*

Degreaser 5

Literature describing the model OP2 vapor spray degreaser, a new basic model for metal cleaning operations which is available in various corrosion-resistant combinations, can be obtained from *Circo Equipment Co.*

Gear Checkers 6

Described in catalog C55-9 are Red Ring universal gear checkers having five standard interchangeable measuring heads for checking various dimensions of external spur and helical gears. Internal spur and helical gear checkers, fully automatic gear checkers for gaging and sorting spur and helical gears, gear rolling fixtures and special checkers set up to make composite checks on all types of gears, are also described and illustrated in detail. Capacity tables are included. *National Broach & Machine Co.*

Centralized Lubrication 7

Typical lubrication systems as applied to production equipment are described and illustrated in the booklet "Studies in Centralized Lubrication 1955." *The Farval Corp.*

Flexible Hose, Duct 8

Flexaust hose and Portovent duct applications in the metal working industries are shown in Bulletin 50 recently issued. *The Flexaust Co.*

Fastenings 9

Recently released is the first edition of a semi-annual catalog on stainless steel fastenings. It combines stock lists, price lists and discount sheets in one handy reference manual. The listing includes over 9000 items and sizes in different stainless analyses. *Anti-Corrosive Metal Products Co.*

(Please turn page)

VOID After May 1, 1956 **3/1/56**

Circle code numbers below for Free Literature, New Plant Equipment, or New Product Information

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Bore-Drilling 10

Pictured and described in a new booklet is an improved method for finish machining holes from the solid. Bulletin 31154. *Ex-Cell-O Corp.*

Anti-Rust Coating 11

Sunkote A, a new anti-rust coating oil for improved low-cost protection of sheet and strip steel and ferrous castings, is covered in Technical Bulletin 42. *Sun Oil Co.*

MPE Presses 12

A new line of multiple-point enclosed presses is shown in 32-page catalog 11B just issued. Featured are six basic types, from 200 to 2500 tons. *E. W. Bliss Co.*

Block Processing 13

Catalog entitled "Automatic Progress—Thru Machines for Processing Cylinder Blocks" shows examples of latest special multiple-spindle transfer-type machines, ranging in size from four to 28-station units. *W. F. & John Barnes Co.*

Vessel Steels 14

"Comparison of Carbon and Alloy Steels for Pressure Vessels" is the subject of a booklet announced by the *Lukens Steel Co.*

Roll Formed Shapes 15

Catalog 1555, 26 pages, covers the subject of roll formed shapes, including details of shapes being currently produced. *Roll Formed Products Co.*

USE THIS POSTCARD

Tool Steels 16

An expanded edition of blue technical data sheet on "The Working of Tool and High Speed Steels" is now being distributed. This 16-page booklet has 17 charts of detail data on these steels, as well as covering such items as cutting tool angles, table of cutting speeds, temperature ranges and guides. *Allegheny Ludlum Steel Corp.*

Universal Testers 17

Hydraulic machines with capacities from 10,000 to 5,000,000 lb, including standard and special types of vertical and horizontal units, are presented in 12-page bulletin 4401. *Baldwin-Lima-Hamilton Corp.*

Milling Machine 18

Described in bulletin Cl-1 is the Rigidmil, a machine of 5 hp capacity, having an infinitely variable table feed rate, for milling small parts. *Sundstrand Machine Tool Co.*

Flexible Hose 19

Illustrated industrial catalog 200, 64 pages, covers a full range of low, medium and high pressure hoses for air, water, fuel, lube and hydraulic applications, as well as special hoses for steam, LP-gas, Freon and fire-resistant hydraulic fluids, and detachable, reusable fittings and couplings. *Aeroquip Corp.*

Hoist Trolleys 20

Four-wheel hoist trolleys, designed for easy handling on straight or curved monorail systems, are illustrated in two-page leaflet. *Anchor Steel and Conveyor Co.*

Tracing Templates

Available to tool designers and draftsmen is a free new portfolio containing 48 tracing templates, prepared scale full size, for all sizes of strap clamp assemblies, malleable and aluminum hand knobs, speed handles, speed bar knobs, revolving clamp assemblies and swing clamp assemblies. Printed on transparent tracing paper the designer or draftsman need only trace the proper size component for the particular design application. Request on company letterhead to *Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland, O.*

Valve Alloys

Engineering Bulletin, Vol. 1, No. 1, is a new technical publication and in this issue features data on the corrosion characteristics, metallurgical considerations, and chemical, physical and mechanical properties of exhaust-valve alloys. Limited quantity available. Address request on company letterhead to *Thompson Products, Inc., Cleveland 17, Ohio.*

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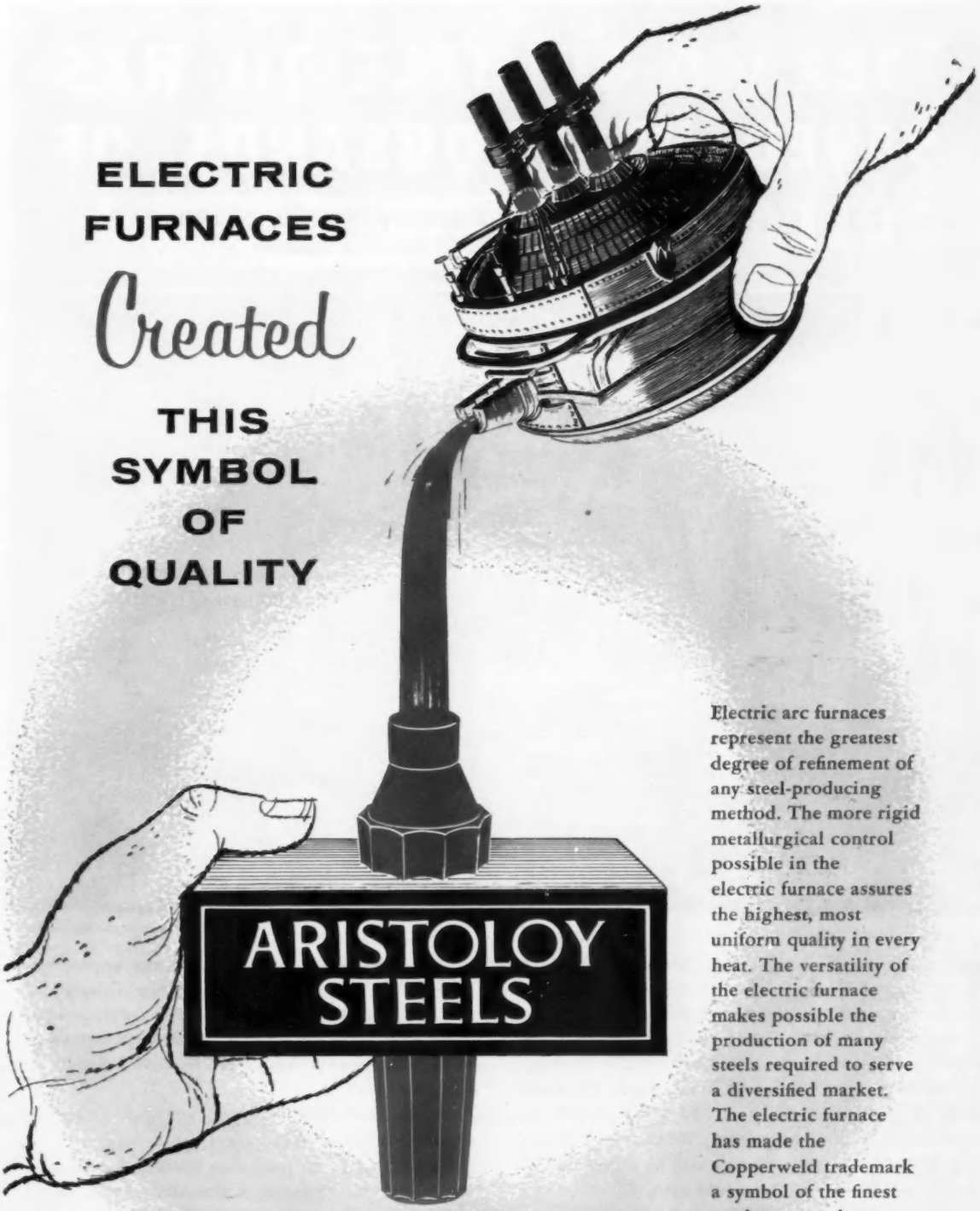

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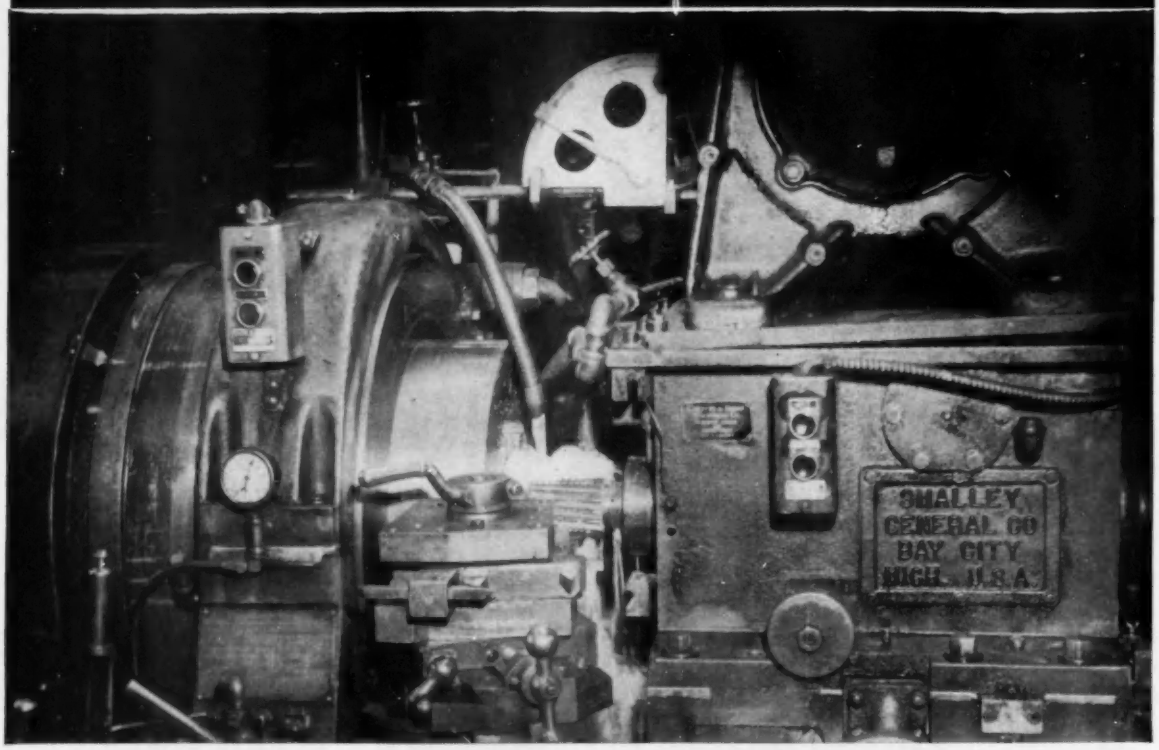

THE JOB is milling a step thread. The coolant is a 1:20 emulsion of *Texaco Soluble Oil C*. Tool performance and finish are excellent, and there is *no rust.*

This ability of *Texaco Soluble Oil C* to prevent rust is particularly important here. At one time this company was forced to keep thousands of dollars worth of finished parts on open pallets for four and a half months in severe humidity. But, they report, "We can thank *Texaco Soluble Oil* for the fact that *we had no single case of rusting or indication of rust on the parts.*"

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A Texaco Lubrication Engineer will gladly help you do *all* your machining better, faster and at lower cost. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS

Men in the News

Sheffield Corp.—Paul W. Polk has been appointed executive vice-president.

Ford Div., Ford Motor Co.—**Charles R. Beacham** has been appointed general sales manager, and **H. D. Hubbs** has been named parts and accessories manager.

American Motors Corp.—**William H. McGaughey** has been elected vice-president in charge of communications.

Eaton Manufacturing Co., Axle Div.—**Frank T. Murray** has been promoted to parts and service sales manager.

Holley Carburetor Co.—**James T. W. Moseley** has been appointed executive engineer.

General Motors Corp., Central Foundry Div.—**David T. Martin** has been made director of quality control.

Bendix Products Div., Bendix Aviation Corp.—**George E. Beringer** is now assistant general manager of aircraft products.

Cross Co.—**A. J. McLaren** has been elected to the board of directors.

American Motors Corp.—**James T. Moore** has been appointed supervisor of the Automotive Product Planning and Information Dept.

Fruehauf Trailer Co.—**S. K. Porter** has been elected vice-president.

Continental Div., Ford Motor Co.—**George A. Haviland** has been named public relations manager.

Brown-Lipe-Chapin Div., General Motors Corp.—**John B. Findling** has been promoted to divisional director of production engineering.

Reflectal Corp.—**Raymond G. Nordstrom** was elected vice-president and general manager.

Dodge Div., Chrysler Corp. — **William R. O'Neill** has been promoted to dealer development manager.

Colonial Broach & Machine Co.—**Donald Robertson** was promoted to purchasing agent, and **Jack White** was chosen assistant sales manager.

Chrysler Div., Chrysler Corp.—**Frank F. Mann** has been named management development coordinator, and **Godfrey H. Miller** has been made sales promotion manager.

Nash Motors Div., American Motors Corp.—**J. E. Johnson** has been promoted to national distribution manager.

Timken Roller Bearing Co.—**H. E. Markley** was named assistant to the president, and **George L. Deal** was made secretary and treasurer.

Goodyear Tire & Rubber Co., Industrial Products Div.—**A. B. Warren** has been named sales manager.

Bendix Aviation Corp., Utica Div.—**Carlton E. Spitzer** has been made advertising manager.

American Motors Corp.—Theodore Ulrich has been promoted to executive engineer in charge of body engineering and research.

Bendix - Westinghouse Automotive Air Brake Co.—**Ellery R. Fitch** has been appointed director of research; **Stephen Johnson, Jr.**, director of engineering; and **R. Van Dyke Firth**, chief engineer.

Ford Motor Co., Special Products Div.—**Robert L. Collins** has been appointed manufacturing manager, and **John F. Cooney** has been named industrial relations manager.

Long Manufacturing Div., Borg-Warner Corp.—**Henry A. Jewell** was made director of purchases.

Standard Pressed Steel Co., Hallowell Collar Div.—**John W. Breitmayer** has been appointed sales manager.

Le Roi Div., Westinghouse Air Brake Co.—**Charles S. Hempelman** has been named market analyst.

Clearing Machine Corp.—**David W. Bonnar** was appointed assistant sales manager.

Soreng Div., Controls Corp. of America—**Willis W. Mansfield** has been elected vice-president and director of manufacturing.

Willys Motors, Inc.—Richard H. McMahon was named fleet sales manager.

Ford Motor Co.—**William D. Cameron** was made executive engineer of Mercury production product engineering; **Kenneth H. Higgins**, executive engineer, Lincoln advanced car engineering; **C. Kurt Hoffman**, executive engineer of Lincoln production product engineering; **Clarence F. Kramer**, executive engineer of body engineering; and **A. E. Vallier**, executive engineer of body fabricating.

Diamond T Motor Car Co.—**Merrill Egeland** is now director of purchases.

Necrology

William H. H. Curtis, Sr., 59, chief engineer for Hupp Corp., died recently, at Detroit, Mich.

Clarke A. Templeton, 52, administrative assistant to the general sales manager of Dodge Div. of Chrysler Corp., died recently, at Washington, D. C.

Walter N. Deisher, 65, former vice-president and general manager of A. V. Roe Canada Ltd., died Feb. 7, at Thornhill, Ont.

W. M. Reed, 63, founder and chairman of the board of the American Filter Co., Inc., died Feb. 2, at Ft. Lauderdale, Fla.

H. A. Flannery, 61, manager of engineering for the Goodyear Tire & Rubber Co., died recently, at Akron, O.

Edwin P. Corey, 79, former general manager of tubular sales for Youngstown Sheet and Tube Co., died recently.

Charles F. Taylor, 87, designer and builder of the airplane engine used by the Wright brothers in their first flight at Kitty Hawk, died recently, at San Fernando, Calif.

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OF HIGH PRODUCTION CASE HISTORIES

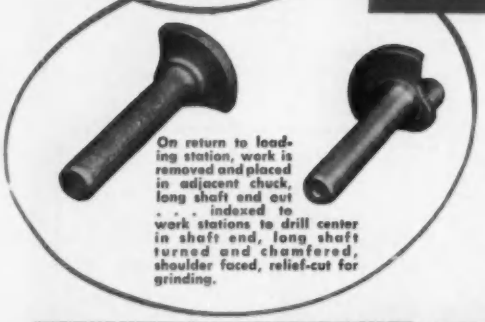
ASK BAIRD ABOUT IT

TURNING BOTH ENDS OF A CRANKSHAFT FORGING . . .

IN ONE CONTINUOUS OPERATION . . .

ECCENTRICITY LIMIT OF SHAFTS .001"

Forging hand-loaded chuck with crank pin end out . . . indexed to work station to turn and chamfer pin, face shoulder, cut relief for grinding.



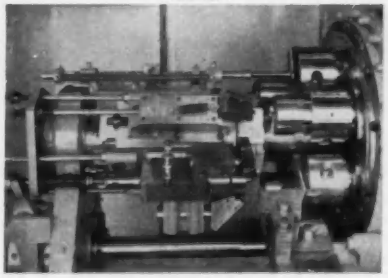
On return to loading station, work is removed and placed in adjacent chuck, long shaft end out . . . indexed to work stations to drill center in shaft end, long shaft turned and chamfered, shoulder faced, relief-cut for grinding.

PRODUCTION 151 PIECES PER HOUR

The Baird 76H Automatic Chucking Machine is set up for double indexing with alternate chucks (6 - 7 inch) arranged to receive the shafts for (first) operating on the crank pin end and (second) operating on the long shaft end.

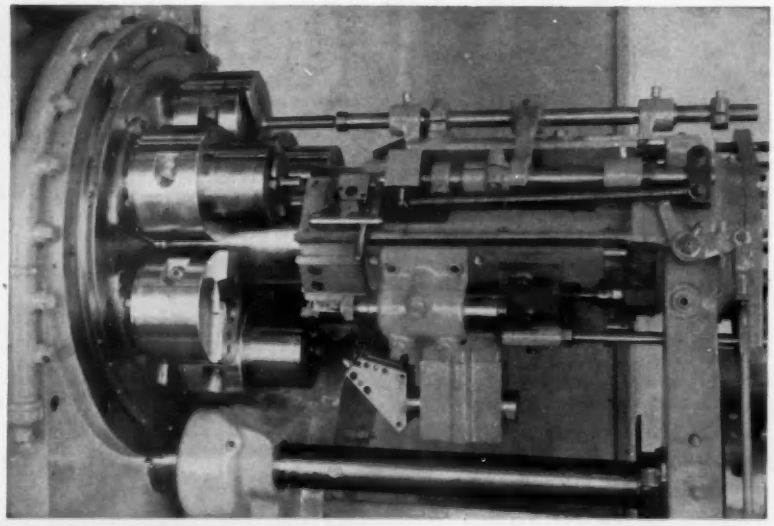
Also provided are a relieving motion mechanism to cut relief for grinding on pin end . . . a 3-to-1 reducing motion for center drilling . . . and a live center attachment to support the long shaft end while turning.

This is indeed automatic high production . . . the type of machine and tooling that can put many a manufacturer in a favorable competitive position. If you have similar parts to produce, "Ask Baird about it!" **Write to Dept. AI.**



ABOVE: Rear view of tooling set-up.

RIGHT: Front view of tooling set-up.



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For engines in heavy-duty service where high operating temperatures are experienced over extended periods of time, Eaton Valve Seat Inserts have proven their ability to materially reduce valve and insert failures, to maintain a high level of engine output—and to add extra thousands of trouble-free hours to valve life.

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Lighter! More Payload Advantages! Improved TDA design using lightweight fabricated steel shoes and brake supports saves many pounds over heavier, more costly brakes.

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For every industrial or automotive application where braking is required!

TDA plants at: Detroit, Michigan • Oshkosh, Wisconsin • Utica, New York
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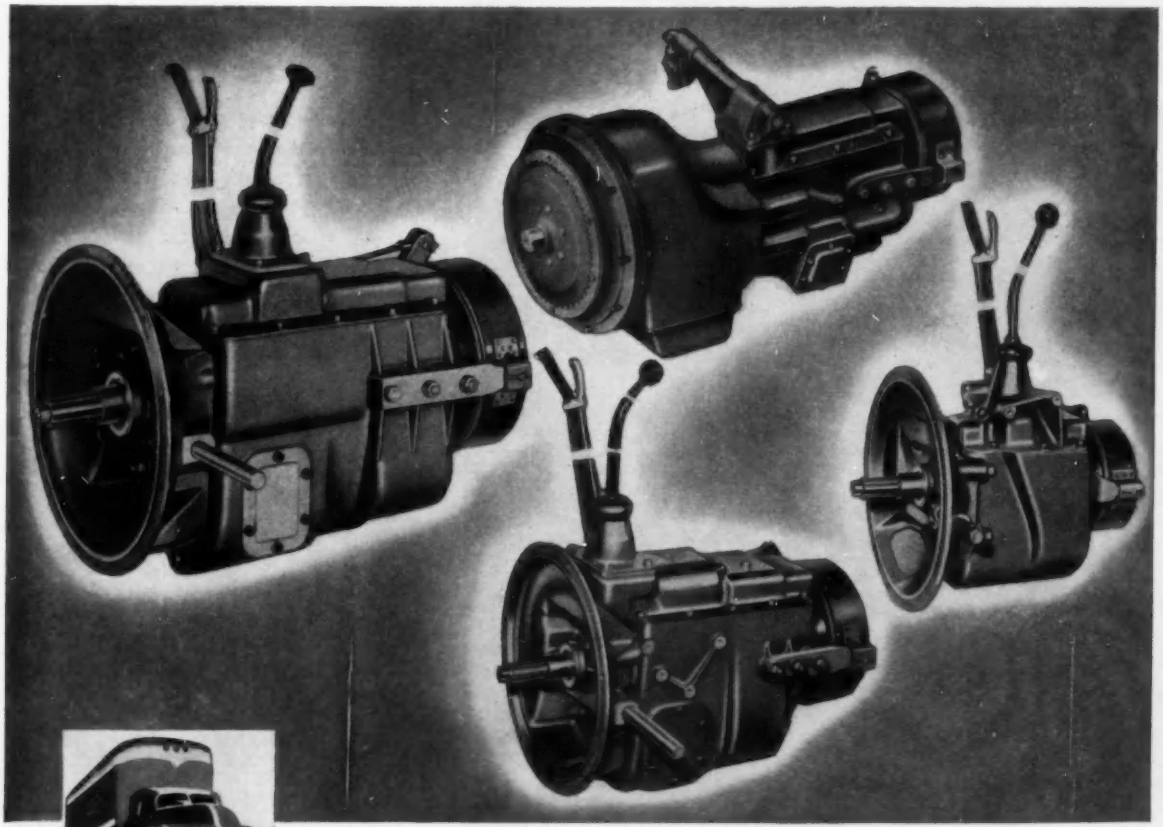

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It's a far cry to days when a transmission was an individual component—a set of gear ratios in a box.

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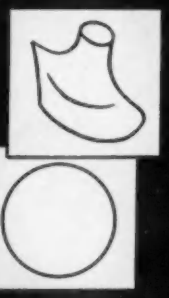

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with simple, inexpensive
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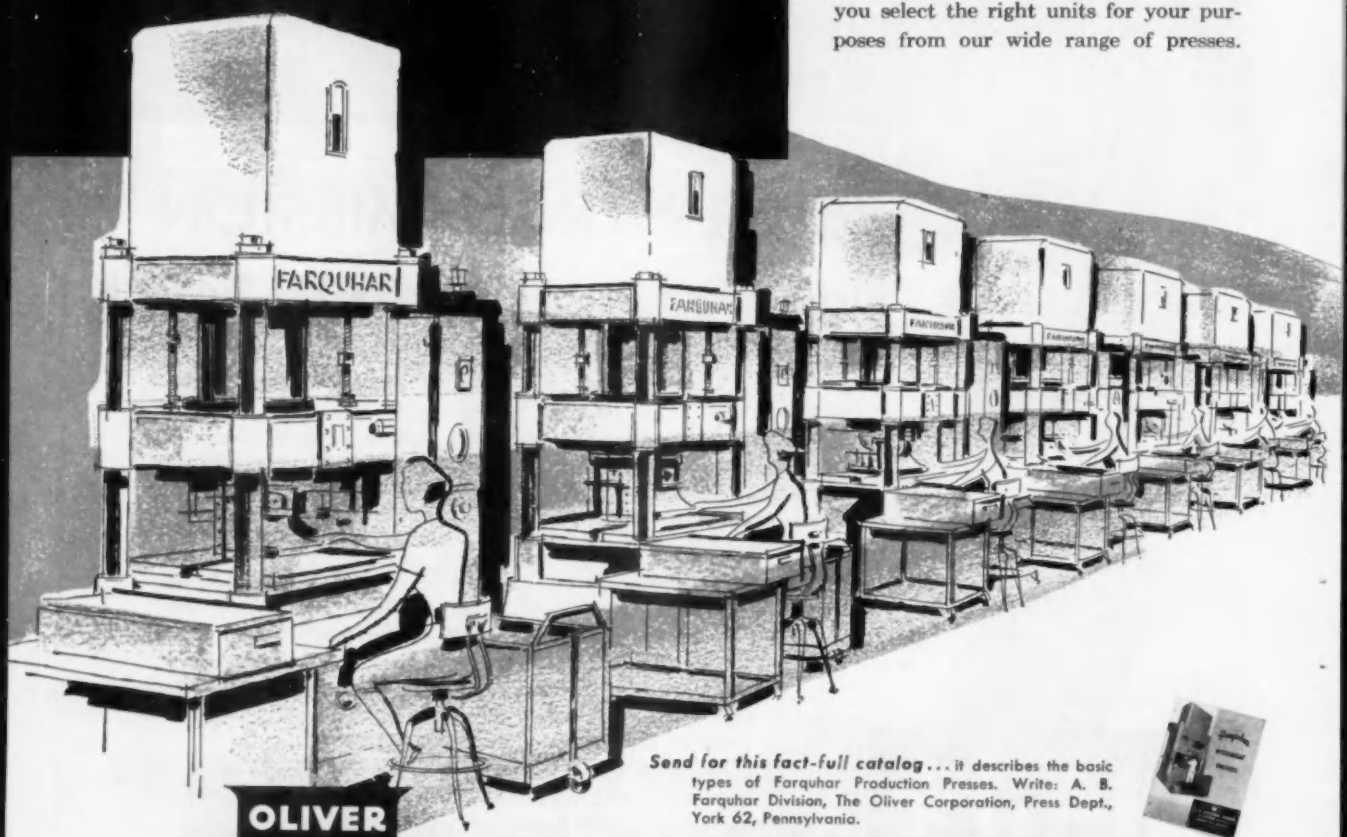
Maintenance costs, too, are minimized by sound engineering and construction. Easy accessibility to all moving parts is an important maintenance feature.

Farquhar engineers are ready to help you select the right units for your purposes from our wide range of presses.



Send for this fact-full catalog... it describes the basic types of Farquhar Production Presses. Write: A. B. Farquhar Division, The Oliver Corporation, Press Dept., York 62, Pennsylvania.

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There's a kind for almost every requirement, classified according to dominant property for easy selection and specification. For example: Class 300 offers the best recovery after compression *of any known rubber!* Class 700 provides serviceability *up to 600 F!* Which class is best for *you?*

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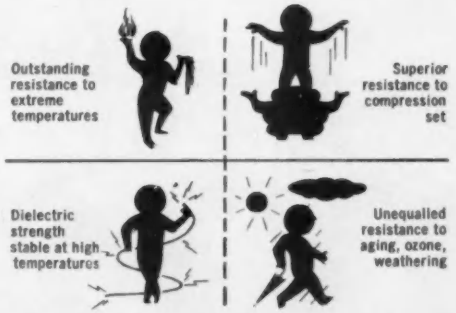
Outstanding resistance to extreme temperatures
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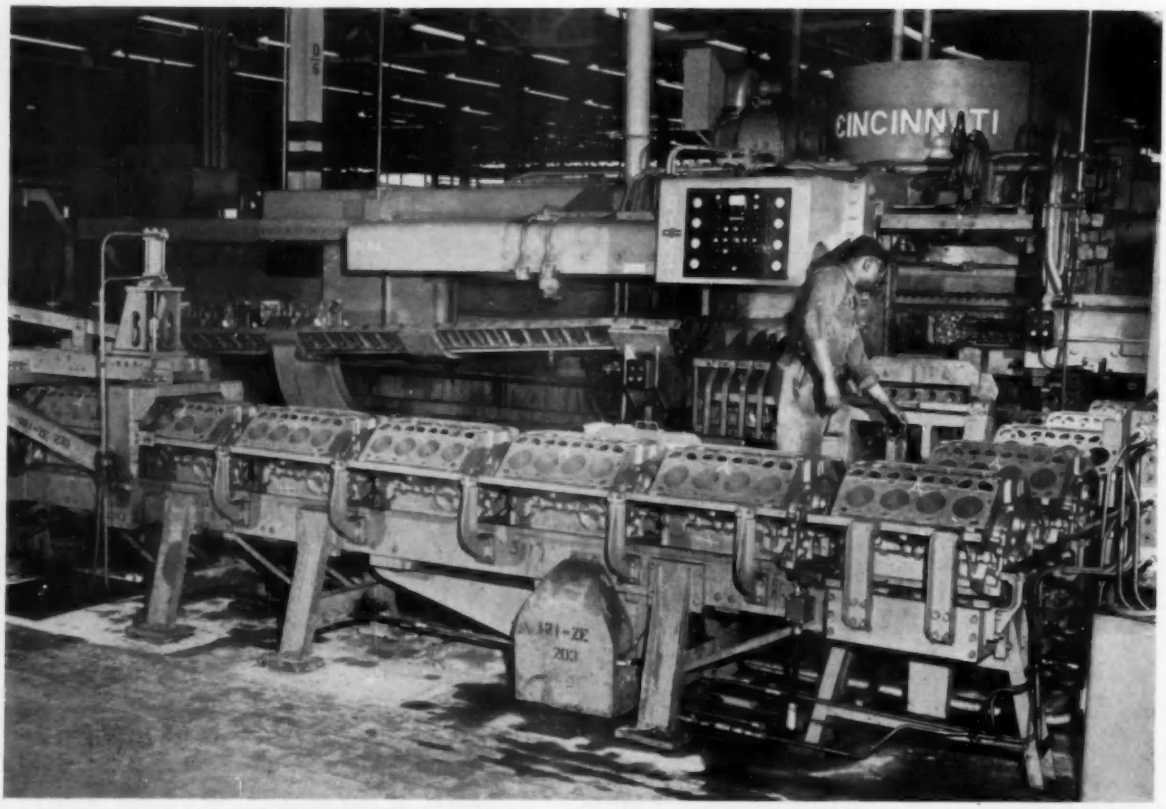
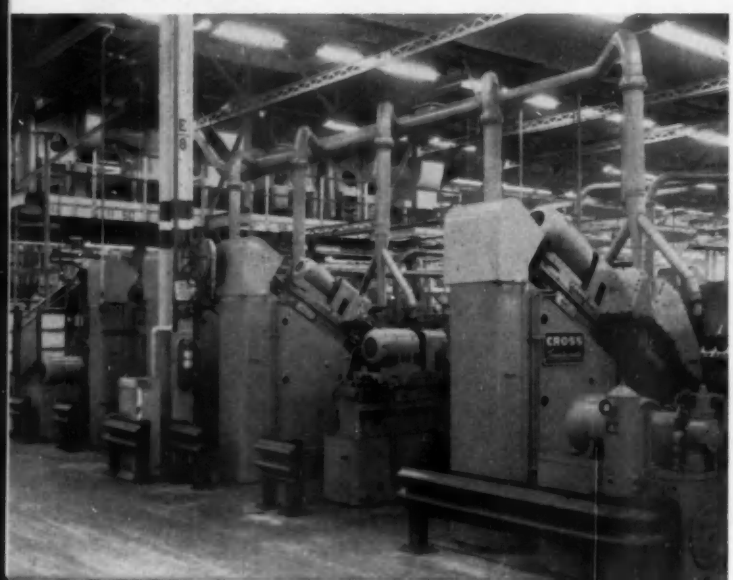


One of the group of two large Cincinnati horizontal surface broaching machines used for initial operations on cylinder blocks

Newly-Designed Transfer Machines in Ford Engine Plant

A portion of the 19 - station Cross Transfer - matic machine on the cylinder block line



CLEVELAND Engine Plant No. 2 of the Ford Motor Co. represents the sum total of previous experience and available methods and equipment at the time it was conceived. It is an outstanding example of evolution in techniques and planning, and the experience gained here will influence the character of the next engine plant in the Ford program—the one at Lima, Ohio. An article devoted principally to automation equipment in the Cleveland Engine Plant No. 2 appeared in the Feb. 1 issue of AUTOMOTIVE INDUSTRIES.

While the big transfer machines found in this plant bear familiar trade names, the fact is that their design and operation have undergone evolutionary changes in the light of past experience. In addition, all of the transfer mechanism is hydraulically oper-

ated. In general, all of the transfer machines have built-in inspection stations, where needed, and built-in probing stations in those cases where blind hole tapping is required.

Easily the most impressive of the major machine lines is the integrated line for machining cylinder blocks. The operation starts with surface broaching in the enormous Cincinnati horizontal broaching machines. A distinctive feature at Ford is the use of two of these machines, instead of the single machine setup employed up to now, to subdivide the job of heavy chip removal and thus increase the productivity of a single line. The first machine broaches the pan-rail and main bearing line while the second one broaches the cylinder banks. Another "first" in this connection is the adoption of Stellite inserts for the first roughing section of the broach. The first section is subject to considerable impact and, in the opinion of Ford tool engineers, the Stellite section will reduce tool breakage as well as increase the life of the entire set of broaching tools on the ram.

The first transfer machine on this line is a 19-station Cross Transfermatic. Among the operations handled in this machine are: milling, spot drill, spot-face, counterbore the distributor shaft hole and locking bolt hole; drill and countersink valve chamber holes; drill and ream two locating holes in pan face; drill and ream dip stick hole; drill and countersink oil pan and main bearing holes; drill, countersink and ream oil pump pad holes; drill one angular oil supply hole; drill four main bearing oil holes.

This machine, as well as other transfer machines installed in the plant, is provided with the Cross Toolometer for holding spare tools as well as for controlling the cycle of tool use at the various heads.

Next the cylinder bores are rough-bored, the front end of the block rough- and finish-milled, and the rear end rough- and semi-finish-milled in an Ingersoll transfer type boring and milling machine.

A special Natco 20-station Holeway transfer type machine is arranged for drilling and countersinking all holes in the front and rear ends of the block. Here the block moves with pan face down and broadside to present the end faces to each bank of heads.

Main bearings then are straddle-milled and bearing notches milled in a five-station Sundstrand Rise-and-Fall, transfer type Rigidmill.

This is followed by a Natco 19-station Holeway transfer machine for the following group of operations: drill oil holes for main bearings; drill oil filter supply hole; drill, countersink, and spotface mounting holes; drill and ream Welch plug holes; drill water drain holes; drill and ream locating hole for oil filter; and mill one pad.

Next in line is a 17-station Footburt transfer machine for the following sequence: drill, ream, countersink, counterbore all holes in top of two banks; drill one oil supply hole in each bank; drill and ream oil dip stick hole; drill oil breather tube hole; drill and countersink "power-and-free" carrier arm holes; drill and countersink ignition wire harness bolt holes; drill and countersink horizontal water drain hole; oil

By Joseph Geschelin

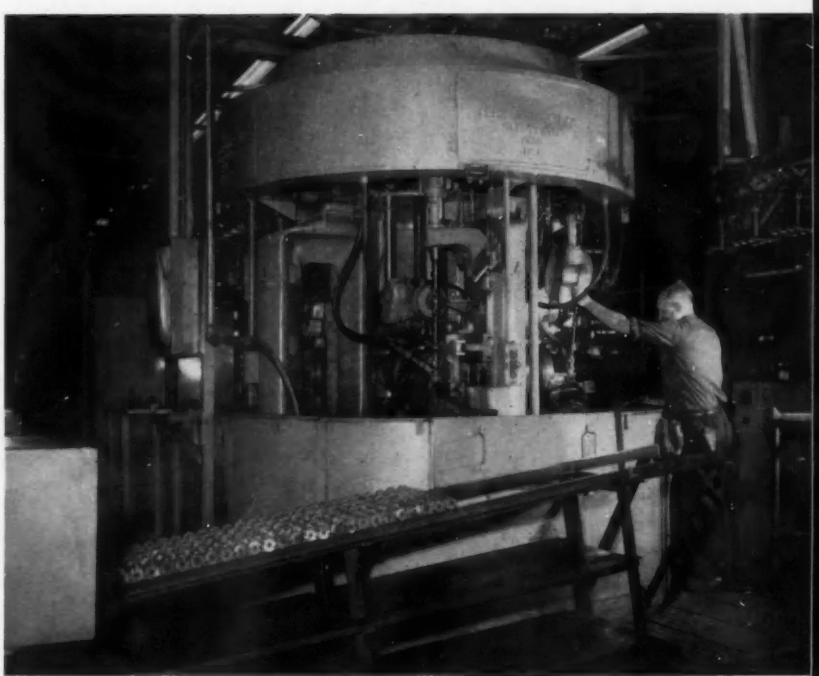
breather mounting holes, and oil pressure unit hole.

Another 17-station Footburt transfer machine is tooled for drilling, and chamfering top and bottom holes; and reaming tappet holes through and to size.

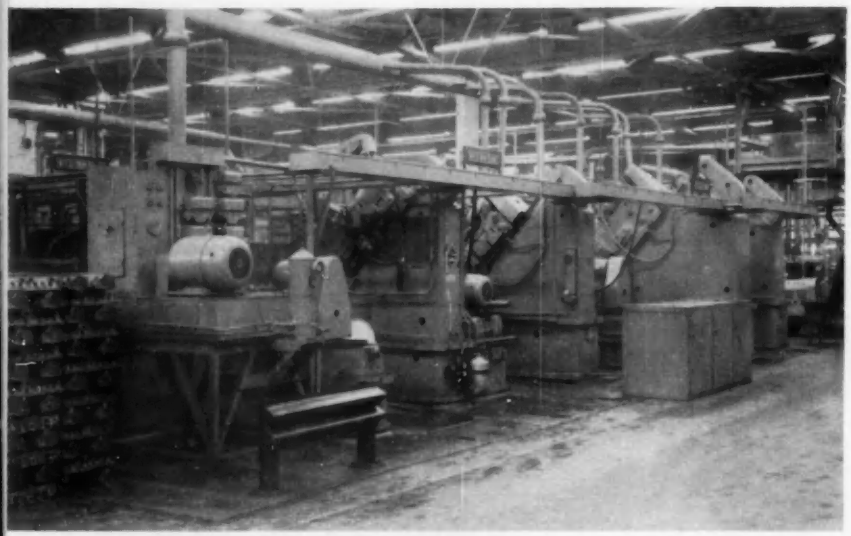
Cylinder bores and semi-finish-bored in a special three-station Ex-Cell-O transfer type boring machine, holding bores to a tolerance of 0.002 in. This is followed by the tapping of all holes in a 14-station Greenlee transfer type machine.

The cam and crank bore lines then are finished in a sequence through a 20-station, and a 13-station Ingersoll cam and crank boring machine.

Cylinder bores are precision-bored to finish size in



Lees-Bradner multiple spindle gear hobber for hobbing the camshaft gear. This single machine is capable of handling the entire output at the present writing.



A section of the 27-station W. F. & John Barnes transfer machine on the cylinder head line

a special Ex-Cell-O transfer type boring machine. Final operation is that of honing to size in Micromatic Microhone honing machines. As blocks leave the honing machines they are inspected and graded in Sheffield gaging machines. The tolerance limits for this operation on the cylinder blocks provide for a range of eight bore sizes in increments of 0.0003 in.

Perspective of the 19-station Footburt transfer machine, fitted with 115 spindles, for an impressive sequence of operations on cylinder heads

It may be noted that before precision-boring of the bores, the block goes through a Cincinnati tunnel type broach for a finishing cut on both banks.

As in the case of the cylinder block, the first operation on the cylinder head is that of surface broaching of all faces — valve ends, rocker arm pads, combustion joint faces, and locating pads — in a three-station Cincinnati horizontal broaching machine of two-way type. In this machine one group of faces is broached with the lower section of the ram; while the other group is broached at the third station on the return stroke of the ram, using the upper section of broaching tools. The operation is arranged to leave from 0.015-0.020 in. of stock on the joint face for finishing later. See middle illustration, opposite page.

The sequence of precision operations—semi-finish and finish-boring of valve stem bores, valve seats, valve throats, and valve faces—is done in a group of three lines of special No. 335 Heald transfer type machines. See top illustration, opposite page.

A great variety of operations is performed in a 19-station Footburt transfer machine of fixed-center, hydraulic-feed type fitted with 115 spindles. Among these are: milling end pads; drilling and spotfacing bolt and push rod holes; drilling and countersinking rocker arm bracket holes; drilling an oil hole; rough-machining intake and exhaust valve seats, faces, and throats; drilling valve guide holes part way through; drilling oil return holes.

Next in line is a 27-station W. F. & John Barnes transfer type machine for the following operations: drill, counterbore, countersink, ream, and tap holes in intake and exhaust faces; and in spark plug and rocker arm holes and end holes.

At the end of the cycle the joint face is given a finish cut in a Cincinnati tunnel type surface broaching machine.

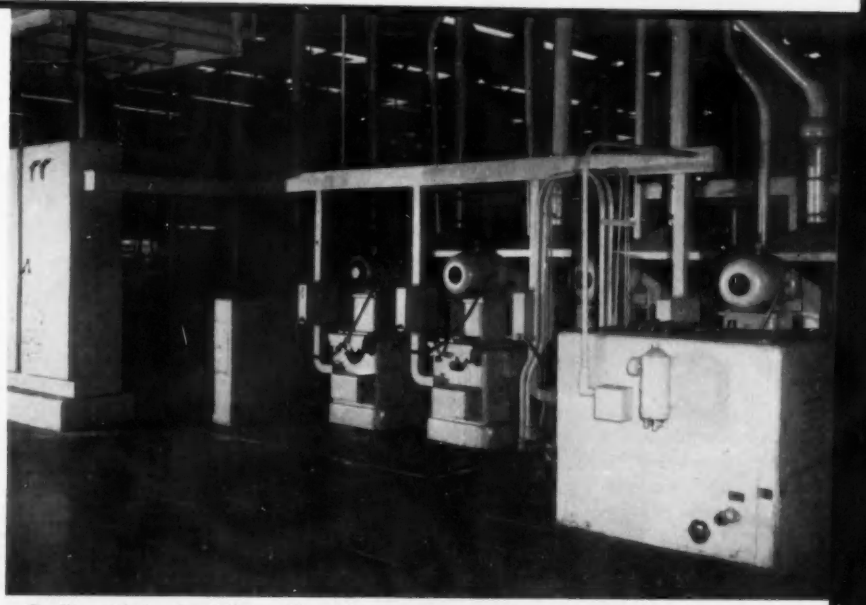
Immediately following completion of machining operations the heads move to a special assembly machine, fitted with a large

indexing table for preparing the cylinder head assembly, for installation on the engine assembly line.

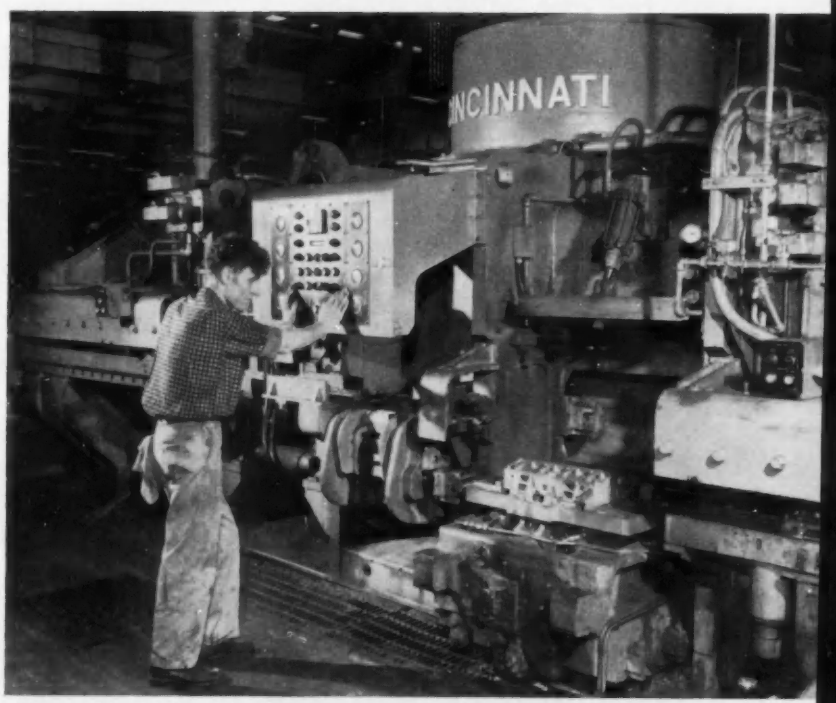
Intake manifolds, which require rather intricate processing, are completely machined in two Cross units, the cycle being entirely automatic. The first group of operations—machining of water outlet and cylinder head joint faces, as well as drilling and countersinking of holes in water outlet pad—are handled in a Cross seven-station, dial type machine. Here the manifolds are clamped in upright position with the joint face outward.

As the part is unloaded, it moves by automation directly to the adjacent 13-station Cross Transfer-matic machine where it is positioned automatically in horizontal position with the carburetor pad up. It is then subjected to the following group of operations: mill, drill, chamfer, tap, and core-drill carburetor pad; drill and tap vacuum hole; drill and tap bracket holes; drill all holes in mounting flanges. Exhaust manifolds are machined completely in a single cycle through a 10-station Cross Transfer-matic.

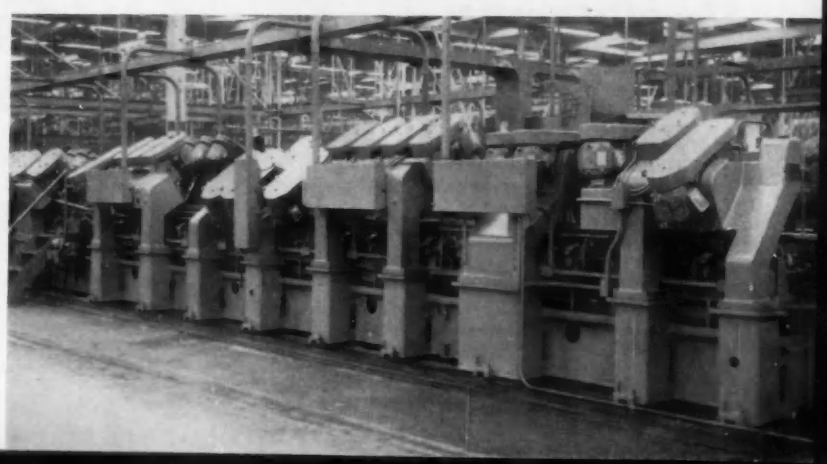
Here are a few highspots in the camshaft department: The preliminary operation of centering both ends is done in a special trunnion type Morris centering machine. All cam forms are ground directly from the rough casting in Landis cam-grinders. An interesting feature is a single, four-station Lees-Bradner vertical hobbing machine for hobbing the camshaft drive gear. After hobbing, the gear is shaved in a Michigan Tool shaving machine fitted with a circular cutter. Final operation is a Granodine phosphate coating applied in an automatic Udylite plating machine.



On the cylinder head line—side aisle view of part of one of the three lines of special No. 335 Heald Bore-Matic transfer type machines



Work station of three-station Cincinnati horizontal surface broaching machine on cylinder heads



Perspective of 45-station Kreuger-Barnes transfer machine for drilling oil holes and lightening holes in crankshafts

Chevrolet Brings Out Line of Heavy Duty Trucks

CHEVROLET has entered a heavier duty commercial field with the introduction of 40 new vehicles, all in the 2½-ton class. These include models which have nearly double the capacity of any previous Chevrolet truck. Ratings range up to 32,000 lb maximum gross vehicle weight and 50,000 lb gross combination weight.

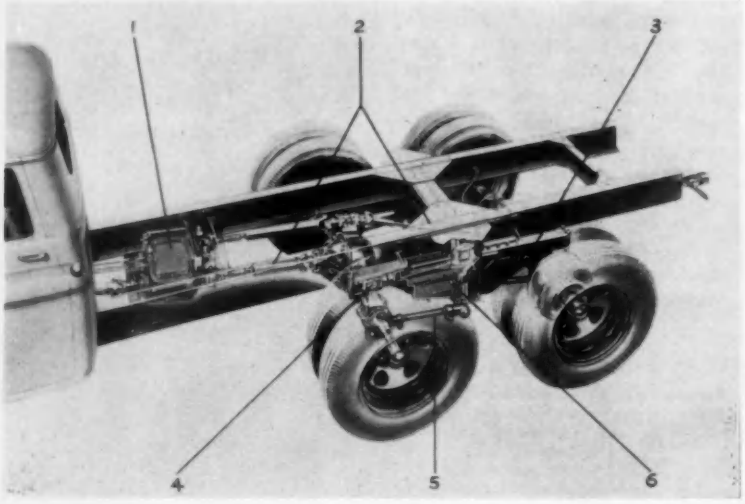
With the 21 new models, Chevrolet's 1956 truck lineup is expanded to a total of 86 models on 23 different wheelbases, broadest array ever offered by the company. First of the new series, covering half- to two-ton vehicles, were announced in the Feb. 1 issue of AUTOMOTIVE INDUSTRIES.

The heavy duty vehicles, which will be built in the company's new truck assembly plant at Willow Run, features optional tandem axle equipment; (tandems have two independently operating 15,000 lb capacity axles); a six-speed, fully-automatic transmission, the Powermatic; a wide assortment of axles, ranging up to a capacity of 18,000 lb; a new 195-hp V8, most powerful truck engine ever featured by Chevrolet; and two 60-passenger school bus chassis, largest yet offered by the company. The Powermatic Transmission was described in AUTOMOTIVE INDUSTRIES, issue of Feb. 15.

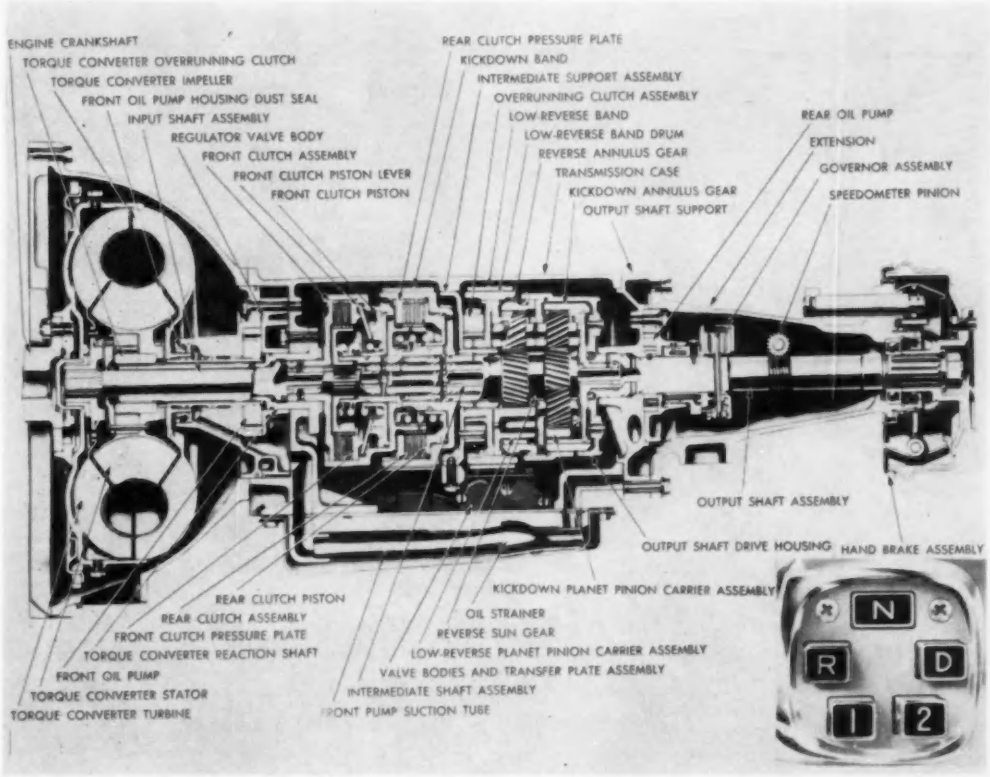
Representing four additional series or groups of trucks in the line, the 21 new heavy-duty models have a maximum GVW rating of from 17,000 to 32,000 lb, while the GCW rating ranges from 34,000 to 50,000 lb. Nominally rated at 60-pupil capacity, the two new heavy-duty school bus chassis

(*Turn to page* 78)

Tandem equipped 2½-ton tractor with trailer



Optional tandem axle equipment. Features of these units are (1) power divider, controlled from the cab, which operates axles as a unit or separately; (2) tubular drive lines to each axle; (3) walking beam spring housing; (4) walking beam axle attachment with rocking-chair bearing; (5) torque rods that take driving or braking torque and track axles and wheels on highway; and (6) two-stage spring piles which seat in the walking beam housing.



This cutaway view shows the principal parts of Chrysler Corporation's new three-speed Torque-Flite automatic transmission, along with the arrangement of the push-button controls (lower right). Push button controls are located at the left end of the car's instrument panel, as with the present PowerFlite transmission. Major components of the new transmission are: torque converter, planetary gear set, overrunning clutch, 19 hydraulic valves, two multiple disk clutches, and two bands (friction elements).

Design of the Three Speed Torque-Flite Transmission

DETAILS of the Torque-Flite three-speed automatic torque converter transmission announced recently (see AI, Feb. 1, page 35 and Feb. 15, page 34) for use in Chrysler Division cars now have been released by Chrysler Corporation.

It is an entirely new transmission, featuring a three-element torque converter with torque multiplication of 2.7 to 1 at stall speed, coupled with a gear box with three forward ratios—direct; 1.45 to 1 in second; 2.45 to 1 in low; and 2.2 to 1 reverse.

This drive employs push-button controls similar to that on the present PowerFlite, except that the "L" button, previously used, has been replaced by side-by-side buttons "1" and "2."

The wider range of transmission gear ratios permits use of a lower axle gear ratio for improved engine life and greater fuel economy at cruising speeds, plus reduced engine noise and vibration. Typical gear ratio that can be used is 3.18 to 1 compared with the former ratio of 3.36 to 1.

Overall torque ratio at the rear wheels at a start is 21 as compared with 15 to 1 for PowerFlite. This is said to provide over 1/6 more acceleration ability from 0-15 mph; over ⅛ more acceleration from 0-30 mph, compared with the former PowerFlite transmission.

Major advantage of the three-speed drive second gear kickdown is its quietness and the fact that it is effective up to 75 mph before an automatic shift to drive occurs.

Examination of the longitudinal cross-section will give some of the major details of design. First is the new three-element torque converter in which the stator (mounted between the turbine and impeller) is mounted on a single overrunning clutch. This is followed by the front clutch assembly and front clutch piston, the latter being actuated by the system of piston levers. Next is the rear clutch assembly carrying the kickdown band. This is followed by the

(*Turn to page* 80, *please*)

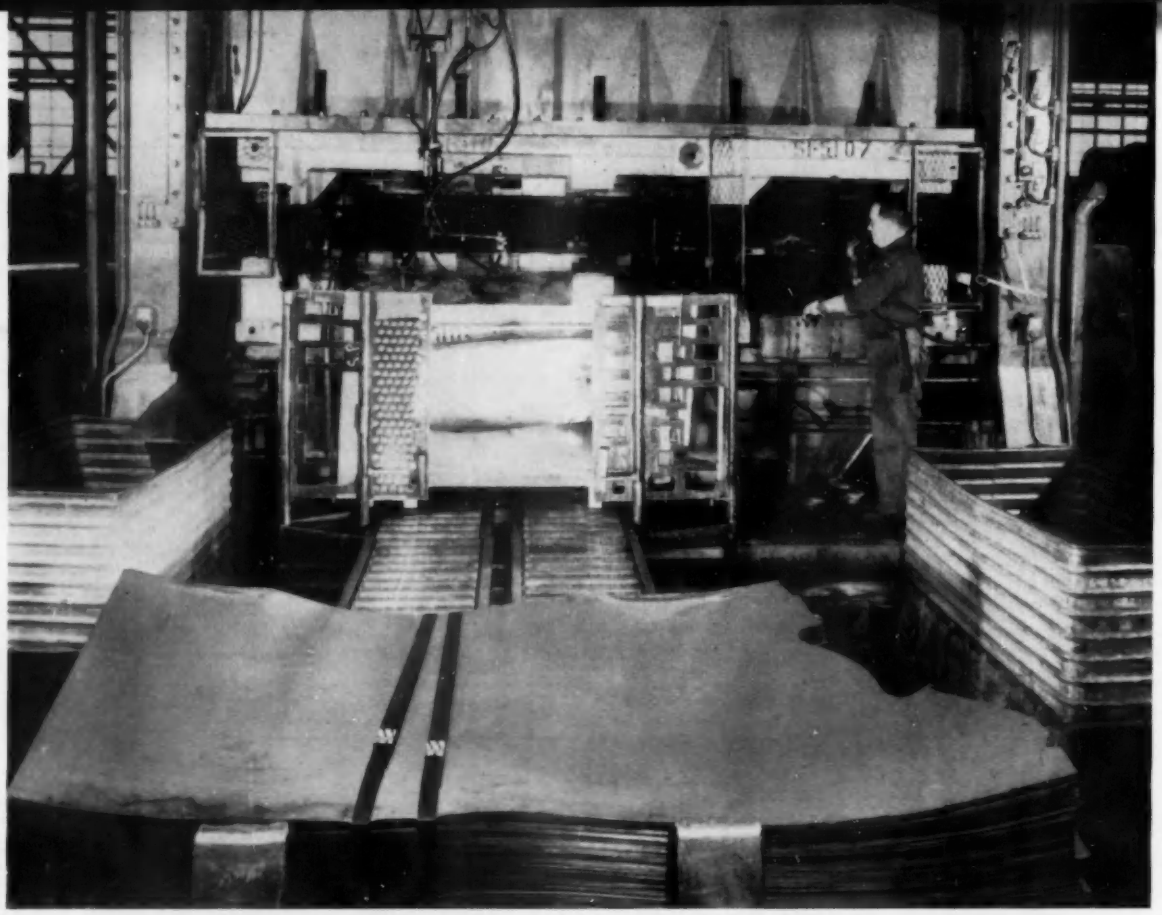


FIG. 1—Rear side of one of the big Danly presses for blanking front fenders and hood panels. Bundled blanks are seen in foreground. In background, overhead, is one of the mechanical arms for removing blanks from the die. The feeding end of each press has been fitted with an installation of McKay leveling rolls and feeder rolls.

Special Setup of Presses for Fender *and* Hood Production

Extensive Materials Handling Facilities Provided at Chevrolet Frame and Stamping Plant

HIGHLIGHTS of the new Chevrolet Frame and Stamping Plant on the outskirts of Flint published recently (see AI, Feb. 15, 1956) dealt mainly with tubular frame fabrication. This article is concerned with the manufacture of Chevrolet front fenders and hoods in the stamping section which occupies a floor space of approximately 275,000 sq ft.

Blanks for fenders and hoods are produced in large Danly presses (Fig. 1), the stock being fed to the presses by an installation of McKay leveler rolls and feed rolls. They are then delivered to the press lines.

A noteworthy feature of the press shop is the provision of a basement gallery for servicing the large battery of presses. The first floor is built over closely-spaced 20-in. I-beams, providing an extremely massive construction. The basement floor consists of a 36-in. thick reinforced concrete slab, the presses being erected upon heavy reinforced concrete columns supported on the basement slab. Consequently, all presses used here project through openings in the first floor with the lower section suspended above the basement floor to permit easy access for maintenance.

Scrap Conveyor System

Traversing the basement gallery under the main row of presses is a heavy duty loose scrap conveyor

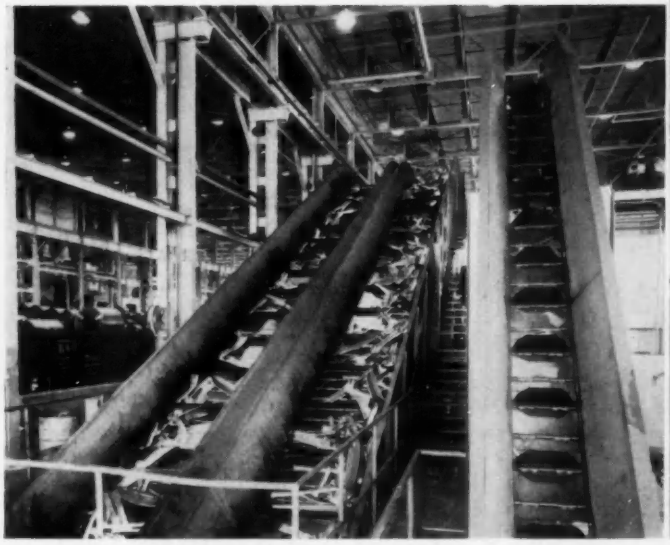


FIG. 2—Three parallel lines of Planet scrap conveyors are seen here as the system rises to ceiling level from the basement gallery.

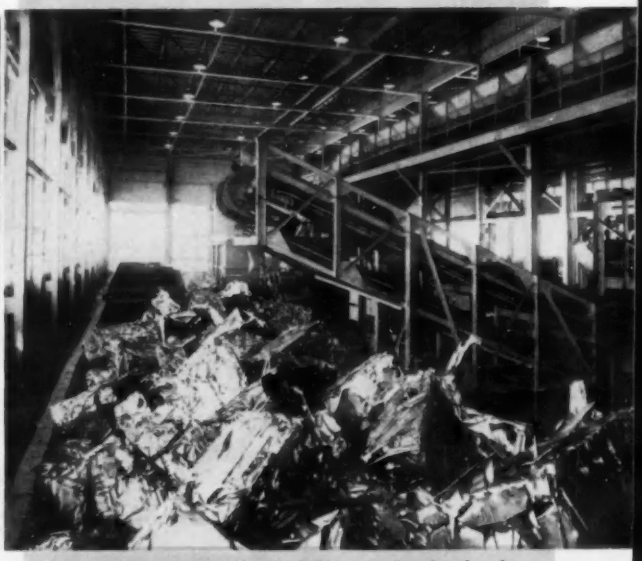


FIG. 3—View along the freight spur track, showing bales loaded in a freight car. In the foreground to the right is the terminal end of the Planet conveyor system in the act of dropping baled scrap into car.

FIG. 4—Control tower for operating the three Logeman balers as well as for loading bales into freight cars. Arrow points to one of the mirrors that gives a clear view of load of scrap in a baler hopper.

By Joseph Geschelin

system to which the offal is delivered through chutes from each press. It has sections below the floor, above the floor, and serving the balers. In addition, there is an extensive system of slug conveyors for transporting slugs and other material that is salvaged without being baled. This scrap handling system, some 2100 ft in length, was installed by the Planet Corp., (Fig. 2).

As the scrap conveyor nears the end of the building, it is carried upward near the ceiling of the first floor where it delivers the scrap material to bailing prisses. Here, too, is a rather unique arrangement. Scrap bailing is handled by a group of three Logeman balers, arranged about a control tower in which an operator controls the feeding of scrap selectively into each of the balers. Because of forward planning, the balers are so disposed as to make it possible for the operator to see the work station of each one through a mirror placed near each baler. (Fig. 4).

Similarly, the freight spur track has been located immediately to one side of the tower to permit the operator to inspect the loading operation. As usual, the end of the spur track is provided with a power-driven winch to enable the operator to move the freight cars to facilitate loading, (Fig. 3).

Material handling, in general, has been given special attention in all areas of the plant not only to facilitate handling but to eliminate manual effort. The frame plant has a total of around 11,000 ft of conveyor systems; the stamping plant about 6440 ft altogether.

(*Continued on next page*)

FIG. 5—*Start of a hood line with the 800-ton Danly drawing press in the foreground.*

Conveyor systems, in turn, are supplemented with a profusion of craneways, hoists, and industrial trucks to provide for a comprehensive coverage of all material handling problems.

Hood Panels

Operations on the hood panel assembly have been organized in compact fashion on a row of five large presses (Fig. 5)—four Danly presses for drawing and flanging, and one small Clearing press for piercing. As illustrated (Fig. 6), the entire sequence through this line is handled automatically, i.e., without manual handling, by an installation of Wilson Automation linking the various presses.

First operation is decoiling, cleaning and blanking—decoiling, roller leveling, and feeding to the Danly blanking press being handled by an installation of McKay equipment. A similar setup is employed for producing front fender blanks.

Blanks then are delivered to the press line, the first operation being that of drawing in the Danly press. This is followed by trimming all around. Next is flanging all around, and restrike of the ornament emboss. The fourth Danly press has tooling for the following group of operations—reflange sides,

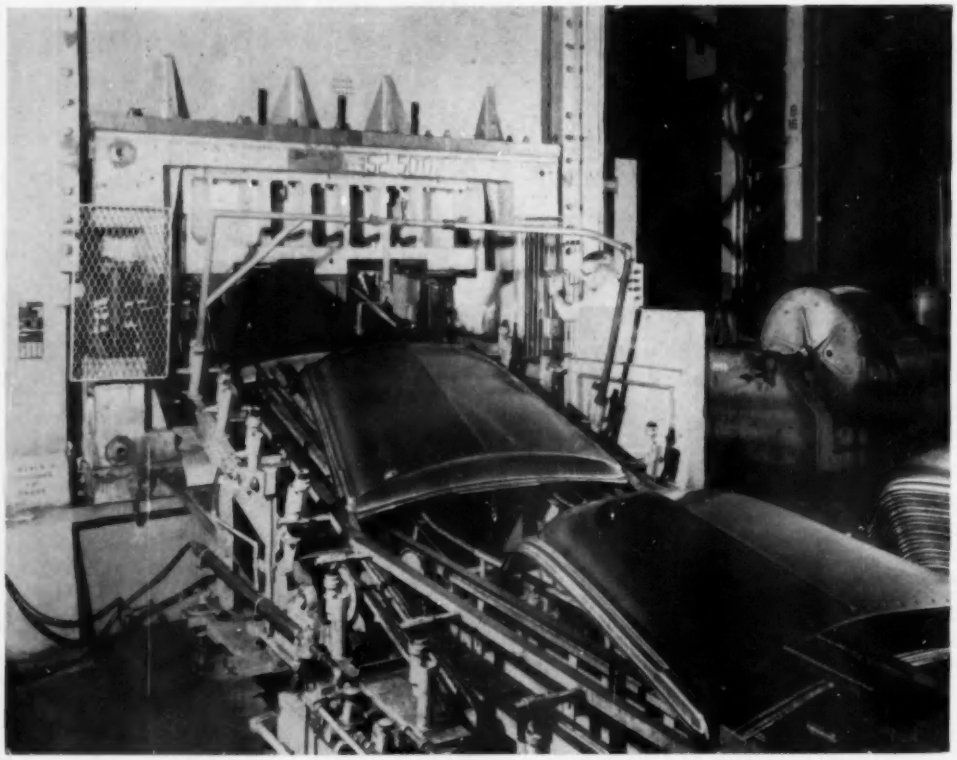


FIG. 6—*(left) Between presses on the hood line is this intricate arrangement of automatic transfer equipment: it removes the stamping from the press to the left, transports it to the next press, and automatically feeds the stamping into the die. In the aisle to the right may be seen one of the large Littel feed rolls used in this plant.*

FIG. 7—*(right)—End of the hood press line. The last press, in the background, is a Clearing used for piercing all holes. Hoods are withdrawn automatically from the last press by the mechanical arm, deposited on the transfer conveyor which then loads them on belts to the right and left, as seen in the foreground.*

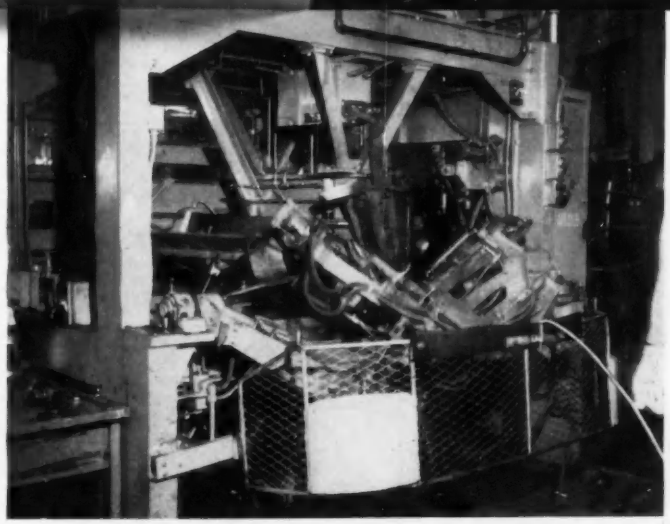
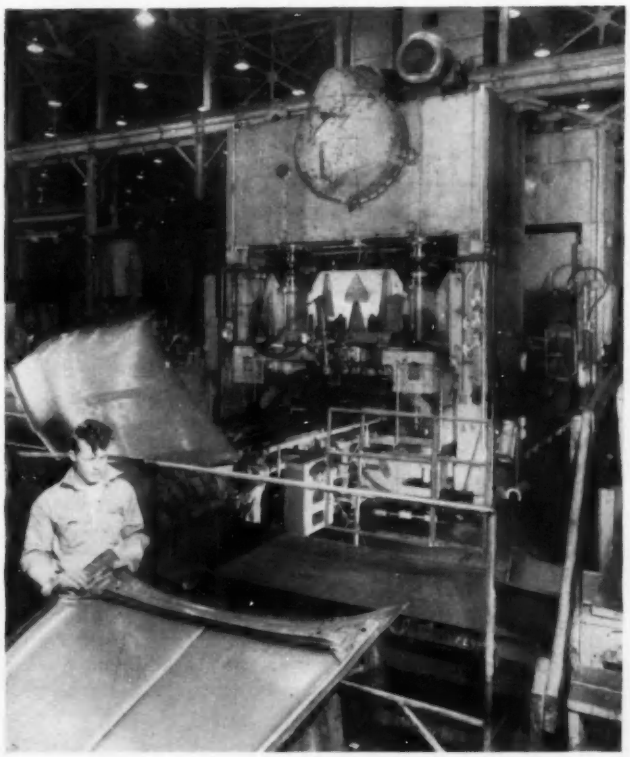


FIG. 8—Above is the special combination bending press and welder used for gathering the nose end of the front fender blank to form a cone. The edges are tack-welded before leaving the machine, then seam welded at the next operation.

FIG. 9—At right—formation of the front fender nose section is done in the press seen here. The location of the nose is in a rather awkward position for forming, and requires inclination of the punch section which may be seen in the background. The operator is holding one of the nosed fenders to show the long seam weld produced after the front end of the blank has been gathered.

flange under, and restrike rear flange. The Clearing press (Fig.7) then does the piercing of all holes.

Meanwhile the hood reinforcement stamping is prepared in another section of the press shop and is delivered to the final operation on the hood line by means of a monorail conveyor.



As the hood stampings leave the Clearing press, they are shunted automatically to the right and left sides onto belt conveyors serving the final assembly welders. At this point the hood panel is fitted with front and rear corner reinforcements which are welded in place.

Front Fenders

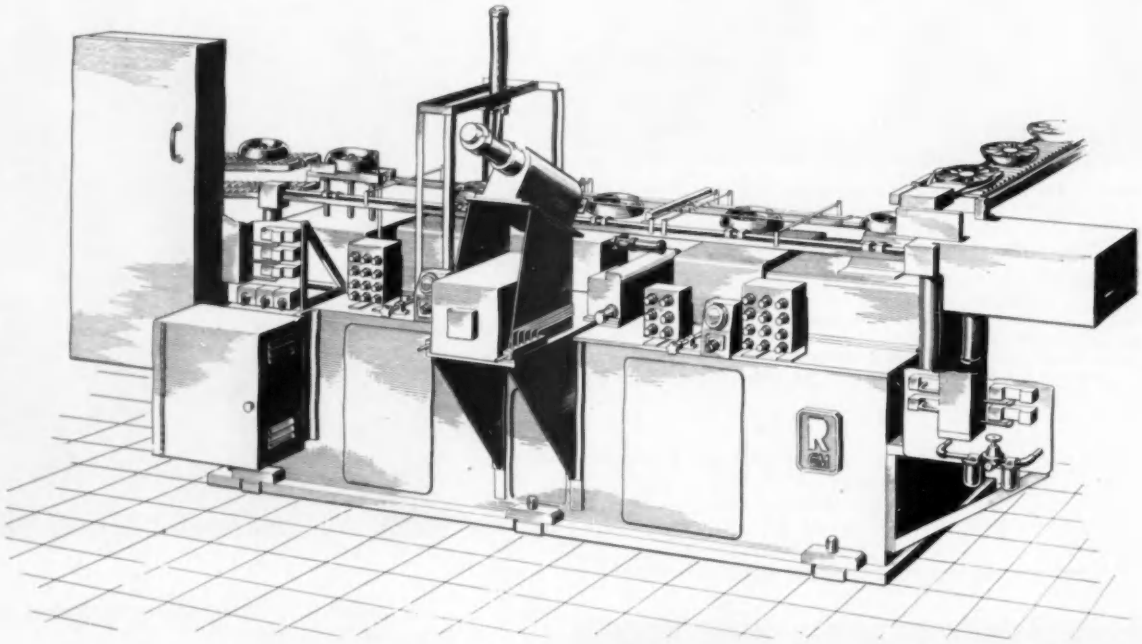
Front fender formation and fabrication poses a much more complicated problem primarily because of the extremely deep nose formation required for styling treatment. The prepared blank goes first to a special press, (Fig. 8) in which the front section is folded into cone shape, preformed, and tack welded. Then it goes to the next machine where the cone end is seam welded, (Fig. 9).

Now the work is presented to the first draw press, this being followed by trimming the nose and sill, parting of the rear end, and first headlamp trim. Next comes the trimming of rails, parting of rear end, and redrawing of the rail bead. This is followed by redrawing of the headlamp section and finish-forming of the grille fit. Flanging of the rail and rear flange comes next, to-

(*Turn to page* 90, *please*)

Balancing Torus Assemblies

in Automatic Electronic Machines



Automatic static multi-station balancer

STATIC balancing of torus assemblies at the Detroit Transmission Division, GMC, in Willow Run, now is done at the rate of about 240 an hour by means of fully automatic electronic balancing machines developed and built by the Special Problems Department, GM Research Staff. Three of these multi-station balancing machines are presently in use. Balance correction is made by welding a measured strip of metal to the torus, holding balance to a tolerance of 0.25-oz in.

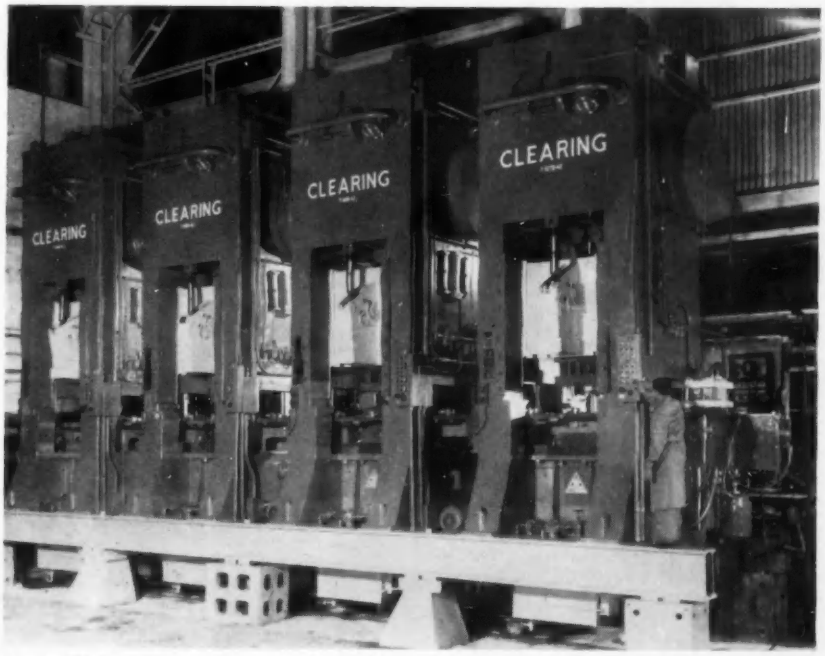
As illustrated, the equipment is of in-line construction with five stations: load; unbalance computer; unbalance correction; balance recheck; and unload. When the torus assembly reaches the loading station it is gripped by two hydraulically actuated arms, turned over and positioned on a locator preparatory to transfer to the successive stations by means of an air-operated shuttle mechanism. For each cycle the shuttle mechanism describes a parallelogram, rising vertically to pick up the parts at their various stations, advancing horizontally, descending to deposit each part on an adjacent station, then returning horizontally to the loading end.

At the unbalance computer station the part is caused to rotate while an electronic servo system determines the amount and angular location of unbalance. Upon stopping, the work is then indexed to align the "light" side with the welding head at the next station.

Meanwhile, the receiver servo mechanism of the correction station, having been set up by the previous computation, automatically measures the length of metal strip required for correction. The strip is automatically cut to length, formed, positioned, and welded to the torus assembly.

At the fourth station, the work is rechecked for balance. Here it is rotated long enough to determine if the residual amount of unbalance is within the specified ¼-oz in. tolerance. A marking device incorporated at this station stamps acceptable parts.

The unload station, consisting of a two-position platform and ejector mechanism, is arranged either to accept or reject, depending on the signal from the balance recheck station previously described. Thus it will eject the torus either into the accept or reject outgoing conveyor system.



The Dunlop automatic press line is shown here fully erected and operating in Clearing's shop

Flexible Press Setup

for Making Automobile Wheels

A NEW press setup recently completed by Clearing Machine Corp. for the Dunlop Rim & Wheel Co. of Coventry, England, Division of Dunlop Rubber Co., was designed to meet a wide variety of conditions.

Dunlop required equipment which not only was capable of increasing output of automobile wheels far beyond present production rate, but also adapted to changes in product design. Still another exacting requirement was to provide a press line to which additional presses can be added, and which will permit a variation in order of operation, with facilities for automatic production of large runs or hand loading for small job lots.

The Dunlop wheel line consists of four Clearing F type presses, a 275 ton lead press, and three 600 ton machines. All are one point, single action machines which feature straight side welded steel frame construction, eccentric gear drive, and plunger guiding.

Overload protection devices are installed on the three 600 ton presses. This recent Clearing development prevents an overload from occurring in the bottom ½ in. of stroke by placing a cushion of hydraulic fluid under the slide adjustment nut.

Each of the four presses is equipped with a 50 ton, self contained pneumatic die cushion. Limit switches have been installed that can be used to stop the equipment if the cushion should fail to rise fully.

All of the presses are equipped with positive cam knockouts on the slides. Spring strippers are built into the upper dies to regularly perform the stripping actions. The positive knockout bars serve as a (*Turn to page* 95, *please*)

The blank

First operation—cupping

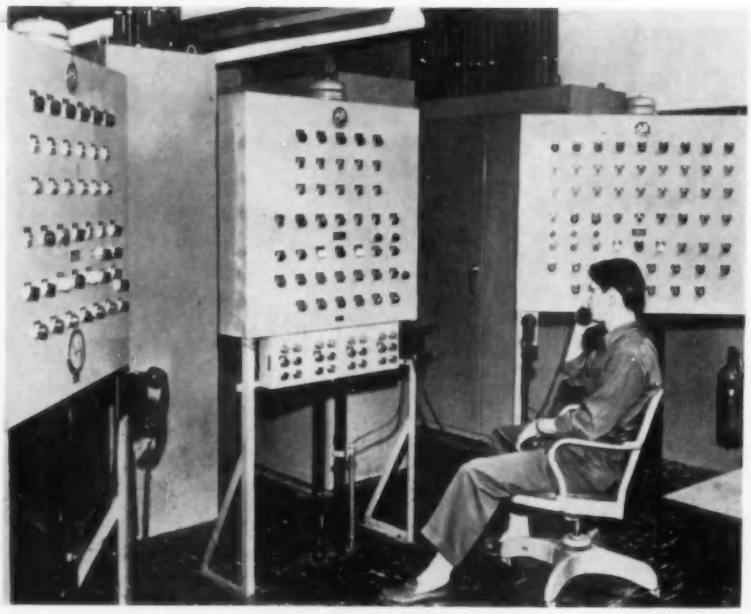
Second operation — reverse forming

Third operation — cupping the edges, piercing the bore and bolt holes

Fourth operation—sizing the holes, undercutting the bosses. Finished diameter: 12¼ in.

VARIOUS STAGES

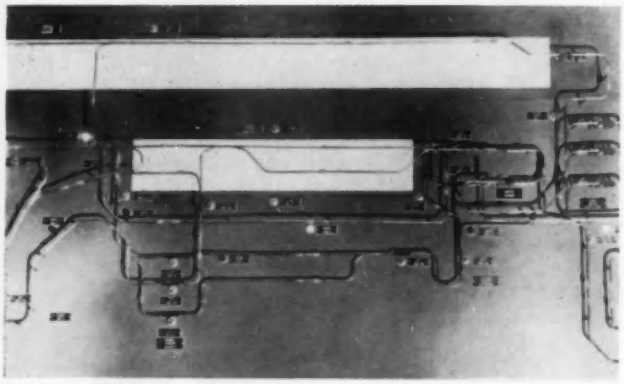
in production of an automobile wheel in the Dunlop line



Main control room at Oldsmobile. All electrical controls for the conveyor systems are housed here. One operator mans this station, and is in communication with operators throughout the plating installation.

Latest Developments in

Plating Automation



Portion of graphic panel located in the main control room of the Oldsmobile bumper line. Rectangular boxes indicate the copper, nickel, chromium plating lines, and the two buffing areas. Lights on the panel show when conveyor sections are running, when lifts are ready to operate, and when racks are floating. When an area is too crowded to receive any more units, it is automatically by-passed.

AUTOMATIC electroplating is becoming the standard rather than the exception. The new Chevrolet, Pontiac, Oldsmobile and Cadillac plating lines were described in AUTOMOTIVE INDUSTRIES during 1955 (see Jan. 15, Feb. 1, Feb. 15, May 15 and Sept. 15 issues). The present article shows additional features of the automatic equipment and controls necessary to operate both large and small plating lines in the modern manner.

Oldsmobile

Automation at the new bumper plating facility just outside Lansing received close attention in the Oldsmobile article. A few points are worth detailing, particularly since cell-type plating is not generally automatic.

The heavy loads of 1000 lb dictated automatic loading and unloading. Each set of plating cells is served by a common elevator, but individual racks are lifted and lowered selectively with a solenoid-operated flipper mechanism at each cell. The Hanson-Van Winkle-Munning transfer mechanism consists of a pair of arms, pivoted at one end, which engage the cross-bar of the plating rack. In loading, the rack is carried from an auxiliary conveyor system fixture, about seven feet to an empty work carrier on the plating conveyor. Unloading is similar.

Each of three standard elevator-type conveyors has separate hydraulically-operated mechanisms for the three phases of the plating operation—pre-treatment, plating and rinsing. Racks of bars over the pre-treatment tanks are elevated, advanced and lowered simultaneously. The racks in the rinsing section are handled in the same manner. Racks for plating cells are individually and selectively handled.

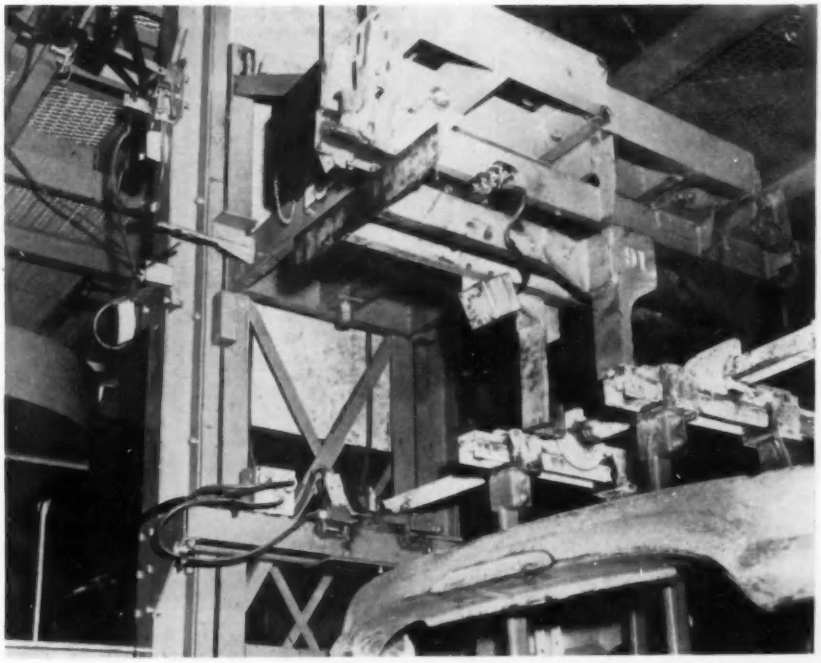
Racks are advanced from the pre-treatment cycle to the cell-plating cycle while immersed in the final pre-treatment rinse bath. A transfer bar moves the carrier horizontally while it is in this tank until it is in a position to be picked up again. Transfer from plating cycle to rinsing cycle takes place conversely.

All carriers have rollers on their ends. These rollers ride on continuous tracks of the elevator. A chain propels the carrier along this track

from station to station.

The elevator assemblies are supported by carrier guides that ride up and down the framework columns of the plating machine as the elevator is raised and lowered. This design is patterned after the standard "roller skate" guide used for lifting carriers on a return-type conveyor.

On each conveyor section an independent pair of chain loops is responsible for the horizontal or forward movement. Each set of loops is driven by a motor and reducer unit. The chains are guided by suitable rails, and are equipped with side attachments that resemble inverted oar locks. The raised carrier engages these attachments, which in turn advance the carrier to its proper station.



At the loading platform of the Oldsmobile copper plating machine, the lift has just deposited a rack of bumper bars. The carrying fixture has been disengaged from the cross-bar of the rack. Note selector switch and dial on carrying fixture. Fixtures are dispatched to various stations throughout the system according to the setting on the dial.

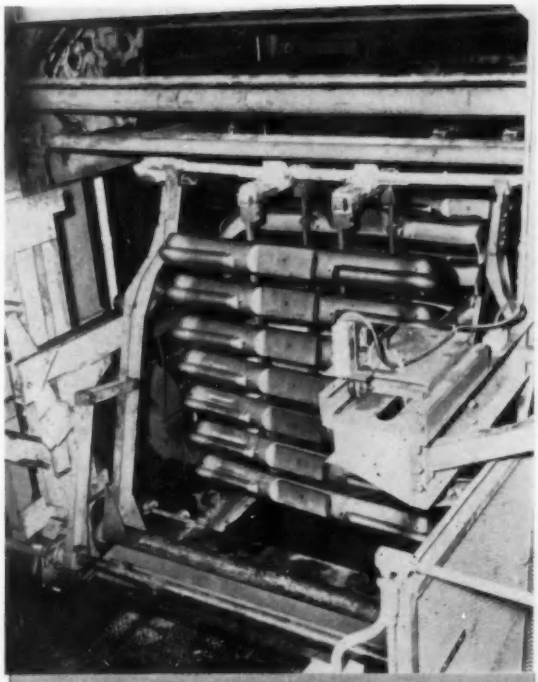
Special features of the plating machines include provisions for advanced pick-up and delayed set-down. For instance, during a rinse and acid etch in the pre-treatment phase of the copper-plating cycle, carriers are picked up early. This is done by a separately-actuated hydraulic mechanism. The operation is controlled by an adjustable timer located in the main control panel of the conveyor.

Delayed set-down is required during the cathodic etch in the chrome plating cycle, and it functions to delay entry of the rack into the treatment. It operates the same way the advanced pick-up does.

Oldsmobile had to automate the conveying operations before, between and after the three plating steps. To do this, the company had Jervis B. Webb Co. build an auxiliary conveyor system with an overall length of close to a mile. Conveying takes place on four separate levels, each level being connected by ramps and automatic elevators.

The fixtures carrying racks of bumper bars act like robots in that they automatically find their way to a designated station, their progress being controlled by 3000 limit switches in the system. The layout of this 5000-ft conveyor system could cover several city blocks. More than 2500 bumpers may be undergoing processing at one time.

Other automatic features of the system include transfer from one loop to another, the by-passing of log jammed areas, and floating on the moving chain



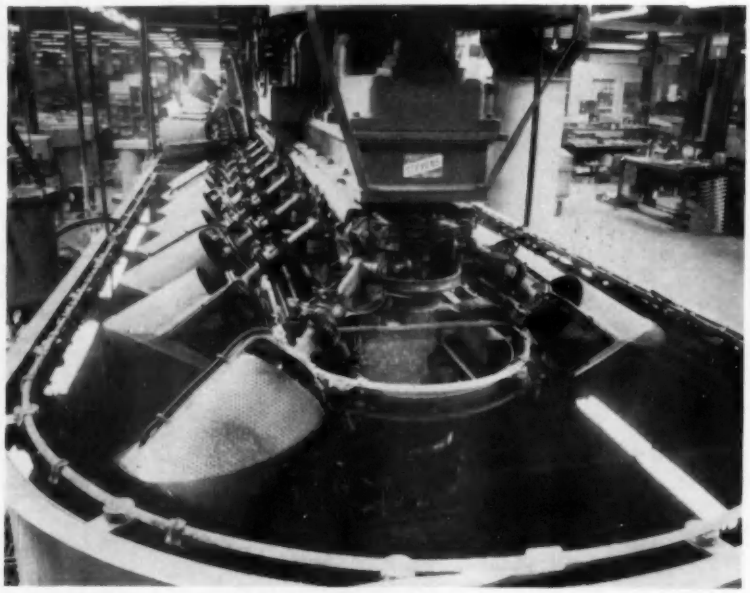
Transferring rack to Oldsmobile copper plating machine. Transfer mechanism is about to deposit a rack onto a work carrier of the plating conveyor. Work carrier is riding on the elevator assembly.

when a slow-up occurs.

This power-and-free conveyor system was designed to convey 1000 lb loads. It is divided into two main parts, namely the copper-nickel and the chrome systems. There are four types of lifts: the two-position type; the three-position type; the offset type; and the rotating type. There are 29 lifts in the system.

The lifts include such features as two-speed operation, carrier stabilizers, automatic transfer mechanism on and off the lift section, limit switch protection devices, etc.

This system also includes 11 spring pusher type, power-and-free conveyors and six solid pusher conveyors. The spring pusher conveyor was designed to store in banks the five-ft-long plating rack carriers without stopping the conveyor.

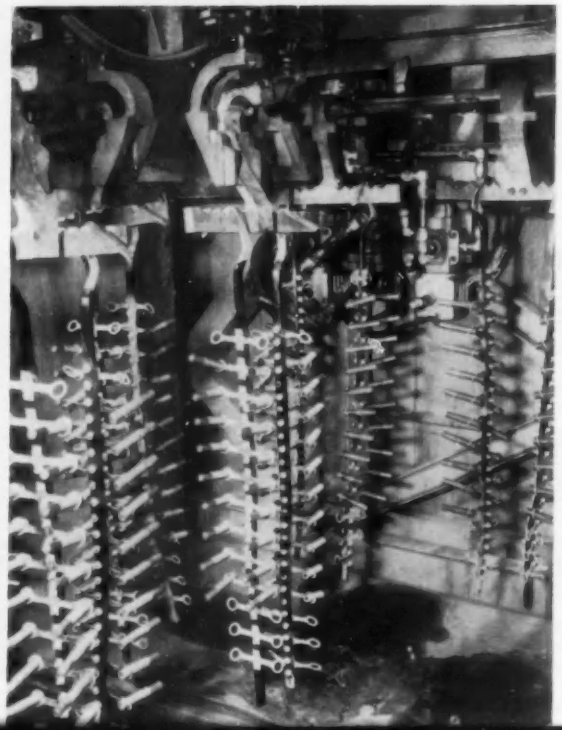


Automatic barrel line at Standard Pressed Steel Co. holds 2500 gal of solution. Product is rotated while being plated.

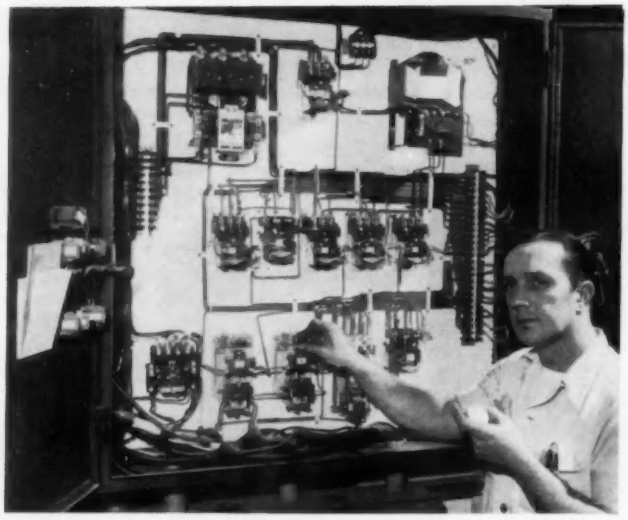
The spring pusher, moving at six fpm, had to start the heavy static carrier load. It was also necessary that the spring pusher start and convey this carrier without losing it. As a result, the spring pressure against the pusher bar required about 250 to 300 lb. Consequently, both the driven dogs on the free trolley and the pusher bar on the spring pusher assemblies had to be made of a special heat treated alloy steel.

When the carriers were banked, the heavy spring pushers caused excessive vibration on the whole system; hence, it was decided to add a driven dog

On Standard Pressed Steel automatic rack line, loaded racks (left) are fed to transfer point by loading-rack hooks carried by the plating conveyor. There the rack hangers are automatically transferred to the conveyor by a reciprocating section of the plating line carrier rail. Racks of finished parts also are returned at this point to an unloading station and then carried around to the loading point.



Below—At control panel for large Standard Pressed Steel automatic rack line, supervisor uses stop watch to adjust time switch for period of immersion in one of the baths.



depressing mechanism. This mechanism depressed the dogs of all the carriers in the bank except the one at the feeder mechanism. This eliminated 90 per cent of driven dog wear and vibration in the conveyor system.

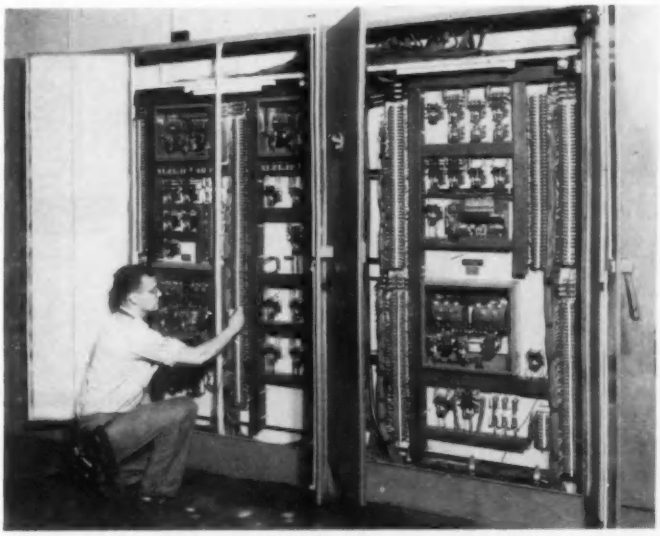
Standard Pressed Steel Co.

This custom plater and supplier of precision plated fasteners recently installed a 60-ft automatic barrel plating line and a 70-ft automatic rack line. These, together with seven other lines, provide some 20 types of plating and surface treatment.

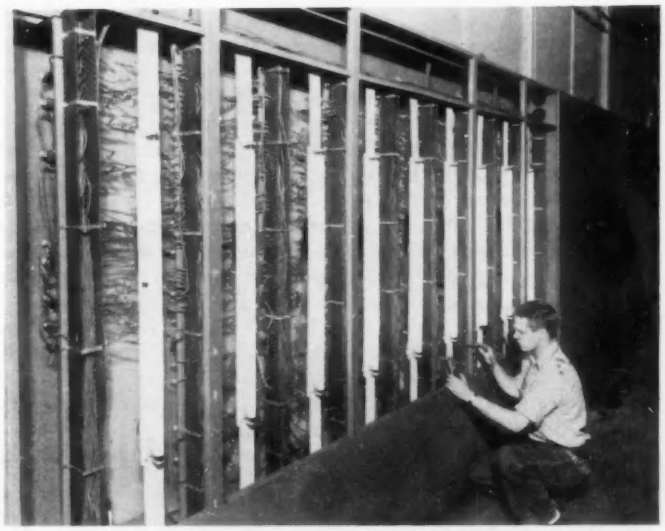
The automatic barrel plating line, built by Frederic D. Stevens, Inc., can handle up to 1200 lb per hour, depending on size of the parts. Udylite current control provides uniform current per square foot of plating surface per depth of plate. Parts are weighed by the batch, to determine the current setting. Automatic temperature regulation is provided by Fulton Sylphon controls on steam and cold water lines.

An automatic rack type plating line handles up to 35,000 parts per eight-hour shift. The Udylite machine requires automatic voltage control supplied by a Weston Electric electronic controller, as well as automatic temperature control.

Allen-Bradley limit switches provide safety features, stopping the conveyor if it doesn't complete full travel, or if a rack isn't picked up properly at the loading point. The automatic loader, which transfers loaded racks and feeds them to the conveyor line, has boosted capacity of the line by 20 per cent. It paces the girls who hand-load bolts or other parts on the individual racks.



These two banks contain relays for only two of the elevators on the Chevrolet machines.



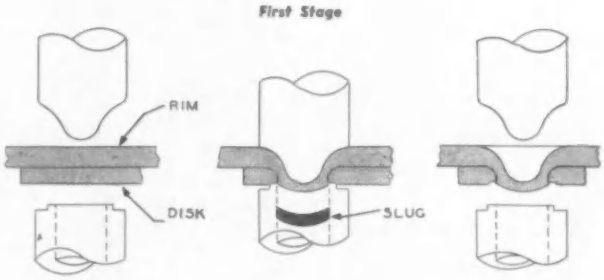
Checking voltage on wire behind the Barnes control panel at Chevrolet, which connects to some 25000 parts.

Chevrolet

At the Chevrolet Livonia, Mich., spring and bumper plant, a two-level plant plates 1200 bumpers per hour. Control equipment is carried on an upper level, while the auxiliary equipment is at ground level. Plating tanks are midway between, for ease of maintenance. There are three 500-ft-long batch-type machines parallel to and independent of each other. Equipment was engineered and installed by the George L. Nankervis Co.

A sequential control system is used to operate the plating machines. In this system operation of any portion of the machines is related to a prior movement rather than a timed interval. Sequential control was used because of the batch type operation rather than simple forward conveyorization. Once started, the machines operate automatically with operators used only to load and unload the bumpers. Installed as a part of the control equipment are W. F. & John Barnes Electro-Graphic Detector Systems used for maintenance purposes. They consist of large illuminated panels showing the complete electrical system in schematic diagram—with wired-in checking circuits. Stop cords run the entire length of the machines which, when pulled, stop the machines instantaneously. Before the machines can be re-started, the control must be cleared, and a warning horn sounded for thirty seconds before operation will begin.

EXTRUDED RIVET PROCESS DEVELOPED *for* Drop-Center Wheels



By Thomas Mac New

WITH tubeless tires being used throughout the automobile industry as original equipment on cars and trucks, there has been an increasing need for leak-proof, drop-center steel wheels. The Wheel Div. of the Budd Co. has developed an extruded rivet process to join the rim to the wheel disk providing a leak-proof assembly.

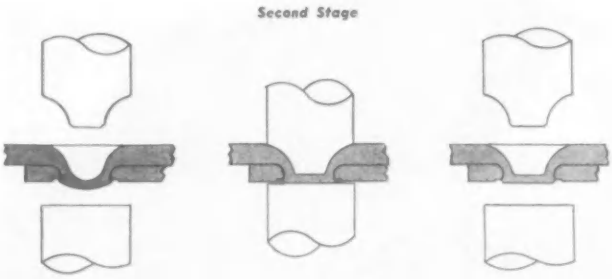
Currently, the division is turning out passenger car wheels by the new extruded rivet assembly technique at the rate of 750 per hour per line. Truck wheels turned out at a somewhat lesser rate are being manufactured for tubeless tires in all highway sizes.

Budd's new riveting technique for wheel assembly is performed in two operations. In the first phase, a round nose punch is used to strike the rim side of the assembly, while the disk side is supported by a die button. As the punch extrudes the rim metal, the action shears a slug from the wheel disk. The rim metal simultaneously flows into the hole vacated by the slug. For the second and final stage, a flat nose punch is used in conjunction with a flat riveting anvil. As the punch supports the rim metal in the hole, the anvil causes the rim metal to flow around the hole in the disk, thereby causing a press fit and locking effect. For larger size truck wheels, 18 rivets are used, 16 for smaller truck sizes, and eight for passenger cars.

Passenger car wheels are produced on a semi-automatic line for both parts production and assembly. Rims and disks are fed to a 400-ton Warco press for the extrusion of the rivets. The die is equipped with eight round nose punches operated by toggles. The ID of the die contains eight die buttons. The ram of the press contains the automation device for removing the wheel from the die, in addition to holding down the work during the operation. After the initial extrusion and with the wheel withdrawn from the die, a toggle-operated lever pushes the wheel onto a flat plate at the rear of the press and into a gravity conveyor. The wheel then rolls onto an elevating device which lifts it, at line production speed, into the loading position for the next operation. A Bliss 600-ton press is used for the final extrusion and upset, and once again the wheel is automatically removed from the press and transferred to the inspection station.

Initially, a visual inspection is given to both the rim and the wheel disks, after which it is inspected by machine. Budd recently had installed wheel gages built by Federal Products Corp. especially for the extruded rivet operation. Two of these machines are used on each wheel line. This automatic gage equip-

Die used for the first operation in the Warco press on the passenger car and light truck wheel assembly line. Note the round nose punches on the periphery of the die cavity and the extruded die buttons on the ID of the cavity.



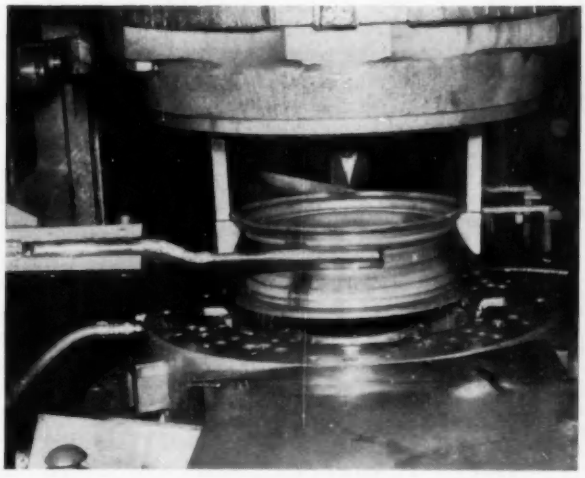
BUDD EXTRUDED RIVET PROCESS

Large size truck wheel showing the construction of the extruded rivet assembly.

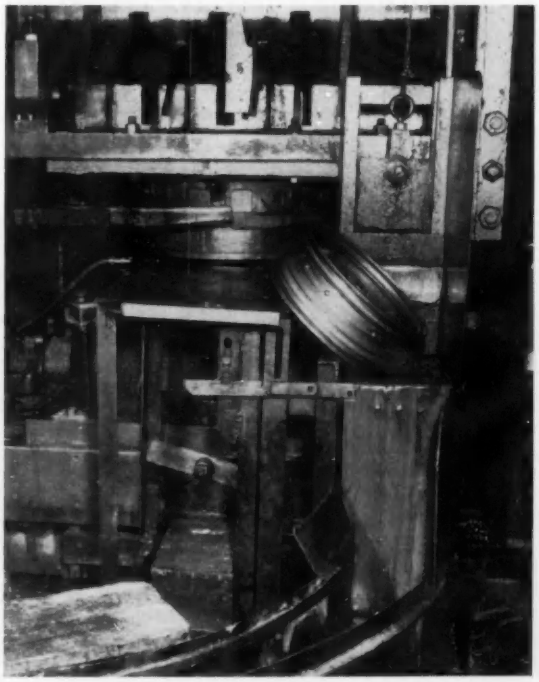
ment checks and sorts automobile and light truck wheels at a rate of 500 per hour. It positions each wheel hydraulically at under 5000 lb pressure to show up any distortion it will have when attached to the brake drum of the vehicle. The hydraulic power pack for the unique automatic equipment was built by Vickers. Controls were supplied by Westinghouse. As the wheel is rotated, the gage measures any non-circular or eccentric condition of the wheel rim and any twist which would cause the wheel to wobble. Good wheels are automatically passed along a conveyor, while those not passing inspection are shunted to one side. This automatic gaging equipment also counts the number of wheels which do not pass inspection and signals the operator once a pre-set number of wheels have been rejected in succession.

Light and medium truck wheels are produced on well automated lines. The heavy duty wheels, because of lower volume and the desire for flexibility, are produced on non-automated lines equipped with production aids. In the assembly of all truck wheels, the first extrusion or indenting operation is performed by a small 50-ton Toledo press. Here the rivets are extruded one at a time instead of on a multiple basis. For the second stage, a 100-ton Ferracute press is utilized. Presses are equipped with a locating device to position the assembly after each stroke.

Automation device used to remove the wheel from the assembly die.



Mechanical handling device used to raise the wheel from the gravity conveyor to press bed level for press loading.



NEW DESIGNS *from the* Czechoslovak Vehicle Industry

The aircooled V-8 engine of the Tatra T603 is carried low in the tail compartment, permitting a large wrap-around rear window. Lightweight construction gives a favorable weight distribution, with only 53 per cent on the rear wheels. It is flange-mounted on the differential housing, and can easily be removed for servicing.

PRAGUE, CZECHOSLOVAKIA

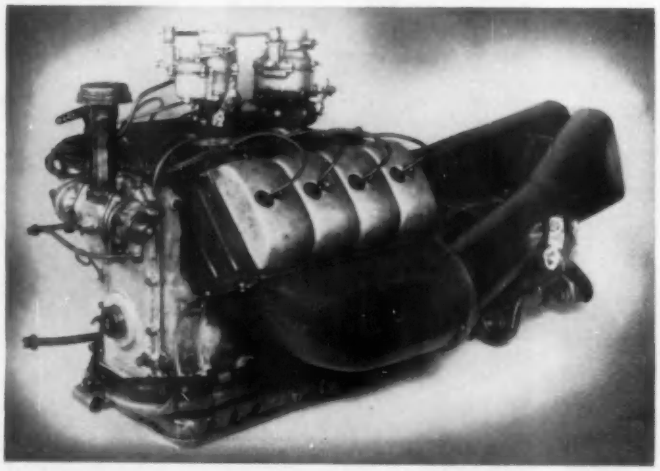
INCREASING emphasis on the export of industrial equipment and engineering goods has given a boost to Czechoslovak vehicle production. While output is still small by Western standards, a considerable expansion is foreseen as new machinery, now being installed in several factories, comes into use. At the same time, the Communist authorities are encouraging engineers to continue the country's long tradition of advanced and original design work. Unorthodox conceptions still being pushed ahead include rear-mounted engines, aircooling, tubular backbone chassis, and all-independent suspension.

The newest development from the Tatra plant at Koprivnice is the T603, now in the prototype stage. The engine is a 153 cu in. aircooled ohv V-8 which develops 100 hp at 4800 rpm. It is oversquare, with 2.95 in. bore and 2.83 in. stroke. Compression ratio is 6.5 to 1. There are two Solex downdraft carburetors. Cooling is by a pair of belt-driven axial blowers.

Of special interest is the location of the camshaft high in the V between the two banks of cylinders. Pushrods to the inclined valves are thereby short and light, and variations in tappet clearance caused by heat distortion of the cylinder barrels are minimized.

With the exception of the cylinders, most of the major castings are aluminum, including the crankcase, oil pan and intake manifold. Total weight of the engine is only 350 lb. In order to reduce overall length, cooling fins on the cylinders are of relatively small diameter but thin and finely spaced. These are machined, not cast. Barrels are at present of cast iron, but according to the designer, Julius Mackerle, it is anticipated that they may be made of aluminum with chrome plated bores.

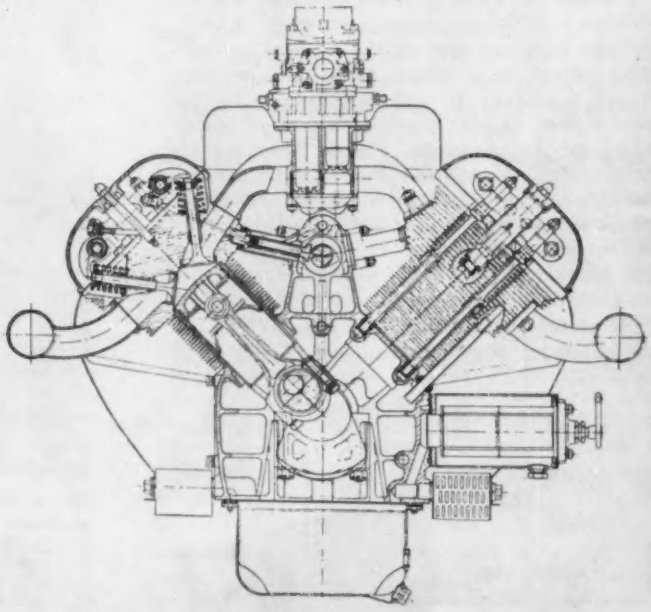
The unstressed design of this unit is underlined by the fact that in slightly modified form it is used in Tatra racing cars running up to 7500 rpm to develop 200 hp. For this purpose compression ratio is raised to 12 to 1 and fuel is alcohol. The cooling blowers are dispensed



In racing form, the Tatra T603 aircooled engine of 153 cu in. develops 200 hp at 7500 rpm. It is run on alcohol and compression ratio is increased to 12 to 1. The twin blowers for cooling are replaced by exhaust pipes centered in the cylinder cowlings which act as venturi tubes to create a forced draft.

Aerodynamic lines of the Tatra T603 are unbroken except for the flat air scoops for cooling the rear-mounted engine.

Below—Aircooled V-8 of the Tatra T603 develops 100 hp at 4800 rpm. Extensive use of aluminum castings keeps the weight down to 350 lb. The high position of the camshaft makes possible short pushrods to the inclined overhead valves.



By David Scott

with, and the exhaust pipes are centered in ejector pipes to suck air through the adjacent shroudings around the cylinders.

Weight of the car is 3080 lb, with only 53 per cent on the rear wheels. This weight distribution compares very favorably with other rear-engined models, which tend to be tail-heavy. For example, the figure for the Volkswagen and Renault is 59.5 per cent.

Production of this model is scheduled to begin at Koprivnice during 1956. At present, output there is concentrated on the 10-ton Tatra 111 six-by-six, which embodies the traditional tubular backbone with swinging half-axles.

The driving system is noteworthy in that the only universal joints used are in the front wheel steering knuckles. Each of the three differentials is coupled to its respective swing axles by two coaxial shafts terminating in a pair of bevel pinions. These engage opposing ring gears, fixed to the inner ends of the axles, which swing around the axis of their pinions with vertical deflection of the wheels. Pitch circles of the ring gear and pinion therefore remain tangent at any angular position, and correct mesh is always maintained. This design is based on a Czech patent dating from 1921.

The engine of the Tatra 111 is an aircooled V-12 Diesel of 894 cu in. volume rated at 180 hp at 1800 rpm. Three camshafts operate the overhead valves in the light alloy cylinder heads. The common inlet camshaft is placed at the bottom of the 75 deg V

between the cylinders, and also drives the two fuel injection pumps above it. Separate exhaust camshafts for the two cylinder banks are located along their outer sides. Injection is direct, and toroidal combustion chambers are recessed in the piston heads. The cast steel crankshaft runs in seven roller bearings.

The transmission includes a four-speed gearbox with a two-speed auxiliary transfer case, giving a total of eight forward and two reverse ratios. Front wheel drive can be disconnected, and the two rear axles incorporate a differential lock controlled from the driver's seat.

Manufacture of the Skoda cars is at Mlada Boleslav, and production has just started of the new model 440, which follows the Czech tradition of a tubular spine with all-independent suspension. New machines and transfer lines now being installed there will raise the volume considerably by the end of 1956.

Of more conventional design are the Skoda 706 RO commercial vehicles made at Mnichovo Hradiste. The seven-ton chassis is used for a truck and a city bus seating 29 passengers. The engine is a six-cylinder Diesel rated at 135 hp at 1750 rpm. Piston displacement is 718 cu in., compression ratio 18 to 1, and indirect injection with whirl chambers is used.

Smaller plants in Czechoslovakia have recently turned out a number of new developments in the automotive line. One of these is a self-adjusting expander unit for hydraulic brakes, produced by Zapadoceske Autodruzstvo in Pilsen. The double-acting assembly has two opposed pistons grooved to take a synthetic rubber sealing ring and a steel retaining ring. The latter fits loosely on the piston, with 0.068 in. lateral clearance in its groove. It is gapped to give a spring action in an outward direction.

During assembly the steel ring is pressed into the operating cylinder, where it expands and firmly grips the inside wall. There it acts as a stop for the piston,

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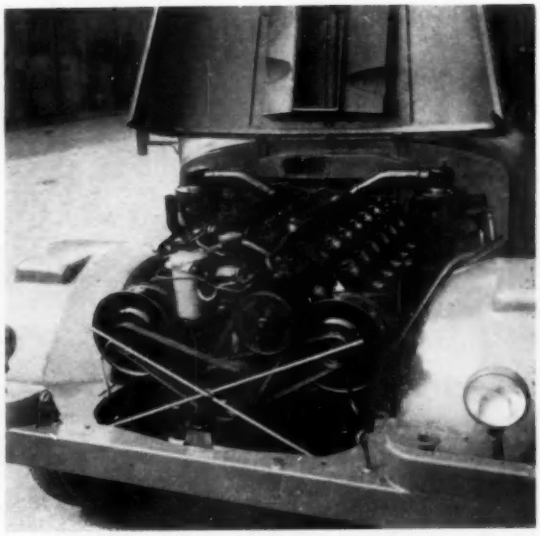

Aircooled V-8 Diesel for the Tatra 111 10-ton truck develops 180 hp at 1800 rpm. A central camshaft operates the intake valves and fuel injector pumps, while a pair of camshafts carried outside the two cylinder banks control the exhaust valves.

All six wheels of the Tatra 111 10-ton truck are independently sprung. No universal joints are used with the swing axles or rigid propellor shaft which is housed in the central tubular backbone. The half-shafts terminate in ring gears which swing around individual pinions carried on coaxial shafts from the differentials.

Self-adjusting brake expander made by Zapadoceske Autodruzstvo. The steel expander ring, floating in a groove on each piston, is pressed into the cylinder where it expands against the bore to act as a return stop for the piston. As brake lining wears and forward travel of the piston increases, the outward hydraulic pressure is sufficient to relocate it. Constant piston and shoe movement is thereby maintained.

AUTOMATION NEWS REPORT

AUTOMATIC CONTROLS
PRODUCTION — VEHICLES — AIRCRAFT

By H. H. Roberts

An extensive study of the future of automation has just been completed by the American Society of Tool Engineers. Following are some of the findings, particularly as they apply to the automotive industries.

METALWORKING INDUSTRIES

As far as industry can see today, automation eventually can be applied to about 16 per cent of all manufacturing operations in the metalworking industries. It is less adaptable to the really big plants than to the medium-sized plants. It is easier to automate manufacture of an engine, a transmission, or an axle, than to automate production of a complete automobile. Automation is entirely feasible in many small plants in which production is relatively continuous on one or two products.

MOTOR VEHICLE INDUSTRIES

The automobile industry, including parts and accessories suppliers, estimates that 20 per cent of all its operations can be automated eventually—a total of some 65,000 operations involving production equipment. Of course some of the large plants in the industry already have made fairly good progress in that direction. Nevertheless, the industry reveals, 35 per cent of the equipment it proposes to buy in the next two years will be automated. The heaviest expenditure in that direction will be in '57. In 1956, the proportion of automated equipment will be slightly below 30 per cent.

While the industry feels that a sizeable portion of its present equipment lends itself to automation, it will prove more profitable in the majority of cases to secure new and modern equipment designed specifically for automation.

The industry is particularly optimistic about its ability to automate eventually a sizeable proportion—about one third—of its machining operations. The breakdown shows that to achieve this, 21 per cent of the equipment would be brand new—thus indicating a market for some 25,000 automated machine tools—and about 12 per cent would represent modifications of existing operations to tie them into automated processes.

The automobile industry has a greater belief than most others that many inspection operations can be automated eventually. The estimate of around one-third of total inspection operations and the breakdown of new equipment versus modified old is almost identical with that for machining.

Materials handling operations show about the same expected potential total as do machining and inspection—about one-third of the total. There is some indication that a slightly higher percentage of existing equipment can be automated than in machining operations, but a majority of the materials handling processes nevertheless will have to be completely retooled to automate them.

The percentage of potentially automatable grinding and finishing operations (25 per cent) is slightly lower than that for machining operations. The returns indicate that new automated equipment is called for by most of these, with a market potential of around 10,000 grinding and finishing machines.

The automobile industry believes that better than 20 per cent of its metal forming operations can be automated eventually, the majority of these simply by modifying existing equipment. About 40 per cent of the operations would call for completely new equipment, representing replacement of around 5000 metal forming machines.

With a high degree of automatization of production welding in body building to date, the industry estimates that only about 12 per cent of its production welding operations lend themselves to automation. Practically all of these would require new equipment, the survey shows. As a result, some 4000 welding machines would need to be replaced by new automated equipment.

AUTOMATION IN AIRCRAFT PRODUCTION

The aircraft industry believes that 20 per cent of all production operations covered in the report can be automated. As a matter of fact, 18 per cent of the purchases of production equipment by the aircraft industry during 1956 will represent automated machinery. For the two years 1956-57, the total will be 21 per cent.

The industry is not too sanguine about modifying present equipment to provide automation. It believes that production can be boosted and costs cut much more with completely new automated equipment.

Best outlook for automation in the aircraft industry seems to be in its machine shops. The report indicates close to 30 per cent of machining operations are eventually automatable, the ratio being about three to two in favor of replacing equipment with new processes. This represents a market for replacement of some 12,000 machine tools in the industry.

Roughly 20 per cent of grinding and finishing, inspection and materials handling operations appear automatable in the industry. About one-third of the materials handling automation could be achieved by modifying existing equipment, but only about one-fifth of grinding, finishing and inspection methods could be similarly converted, the totals show. As a result, some 5000 grinding and finishing machines would need replacement.

At the low end of the scale in the aircraft industry

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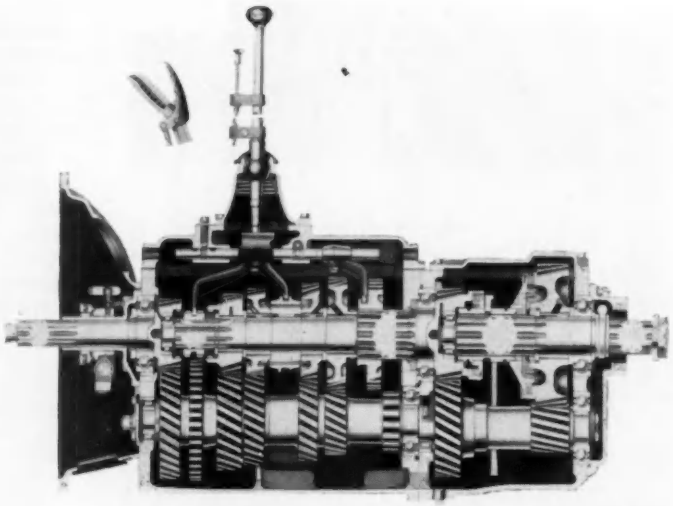
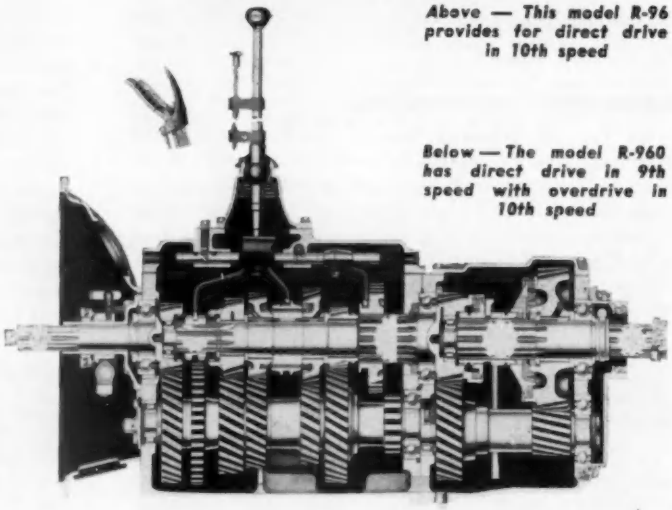
New Fuller Transmission

Has 10 Progressively Spaced Ratios



Above — This model R-96 provides for direct drive in 10th speed



Below — The model R-960 has direct drive in 9th speed with overdrive in 10th speed

THE new R-96 and R-960 all-air shift, 10-speed semi-automatic Fuller RoadRanger transmissions are further refinements of the former models R-95-C and R-950-C which they replace.

The new 96 series models provide all the advantages of the 95 series plus many design improvements. There is no gear splitting — the 10 selective gear ratios are evenly and progressively spaced. Shifts are in an average of 28 per cent steps. One-shift lever gives complete control of ratio selection.

Fuller RoadRanger models R-96 and R-960 consist of two sections — a five-speed transmission with closely spaced ratios, and a two-speed auxiliary with wider spaced ratios. The combination provides 10 forward and two reverse speeds shifted with one lever.

The 10 forward speeds are secured by using the ratios of the five-speed section twice; the first time with the auxiliary section in low gear so that the ratios in the five-speed section are compounded by the auxiliary low gear; the second time with the auxiliary section in high gear. The two reverse speeds are secured by using reverse in the five-speed section through either high or low gear of the auxiliary section.

By using the five-speed shifting pattern twice, the shift lever position for sixth speed is the same as first; seventh the same as second; eighth same as third; ninth same as fourth; and tenth same as fifth.

The auxiliary section is automatically shifted by air after pre-selection of the operating range required. The automatic shift in the auxiliary transmission after pre-selection is always accompanied by a four-step shift in the five-speed transmission, either up or down, depending upon the direction of the shift in the auxiliary.

If the auxiliary shift is upward, the corresponding four-step shift in the front section is down. If the auxiliary shift is down, the four-step shift in the front section is upward.

The new transmissions encompass some important detail design changes that set them apart from the earlier R-95 and R-950 RoadRangers available up to now. Overall length of the R-96 is about 2-15/32 in. shorter and weight is about 60 pounds less.

Examination of the part-cutaway illustrations will show that the spacer or adapter between the two sections of the earlier transmission has been eliminated. The drive gear ball bearing and countershaft front bearing in the front case, and countershaft front and rear bearing of the auxiliary section remain the same. However, the construction within the center section has been changed materially. Here the countershaft and mainshaft first speed gear of the original design has been replaced by countershaft, gear, and snap ring, together with a mainshaft bushed gear to provide the overdrive ratio. All ratios of the R-960 remain the same except reverse which is 3.18 to 1 on both R-96 and R-960.

In general the changes made in both transmissions were accompanied by changes in the number of teeth

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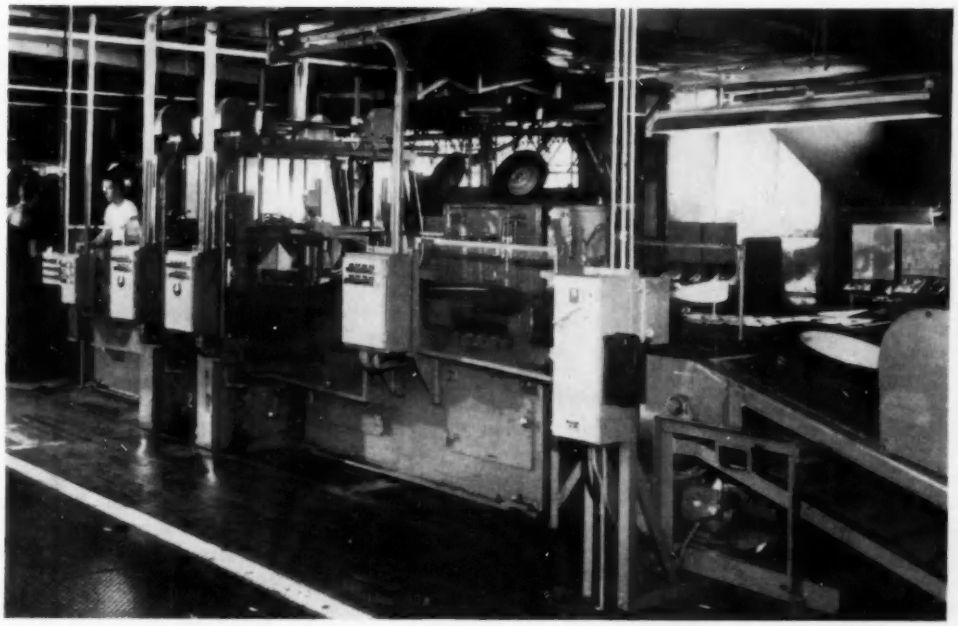

Oldsmobile wheel and tire balancing equipment. As described in the text, the assemblies enter the machine from the power-driven conveyor at the right, leave at the left for the car assembly line. The operators at the extreme left end are responsible for attaching the proper balance weights.

Automatic Balancing of Wheels and Tires on Electronic Machine

A DISTINCTIVE feature of the Oldsmobile assembly line is the first installation of an automatic electronic wheel and tire assembly balancing machine designed and built by the Special Problems Department, General Motors Research Staff. As illustrated, the wheel and tire assemblies enter the machine on a conveyor, leaving on another conveyor at the opposite end without operator attention.

This unique equipment obsoletes the previous manner of balancing, can handle up to 700 pieces an hour, and is sufficiently sensitive to raise balance quality from the previous level of 16-oz in. to 8-oz in.

Result of many years of experiment and development, the basic feature of the automatic balancing element stems from the principle of air-ball pivot suspension, originally developed as a laboratory curiosity — the Research Staff "frictionless" bearing exhibit shown at GM Powerama and Motorama displays. Essentially, the suspension consists of hemispherical cup, fitted with a ball which is floated on a film of air about 0.001 in. thick, maintained by an air pressure of around 60 psi. As a matter of fact, the pivot is so truly frictionless that in the case of this machine, it is necessary to provide a cup of silicone fluid to serve as a damper.

The equipment illustrated here is of four-station design, two stations being employed for balancing, all stations being mechanically and electrically interlocked. An air-operated shuttle mechanism is provided to transfer two wheel and tire assemblies at a time.

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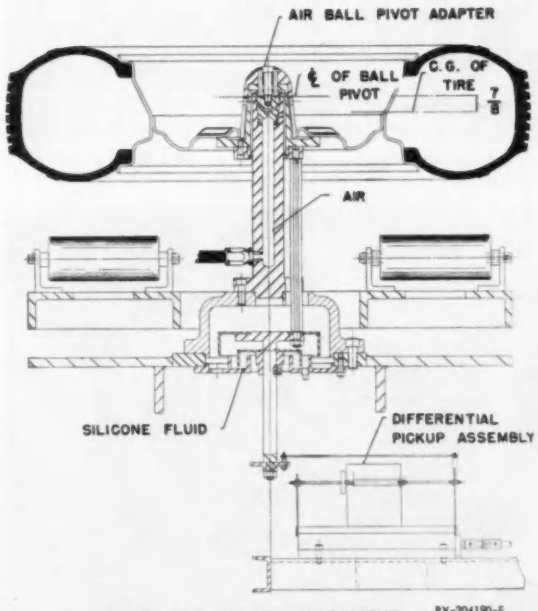
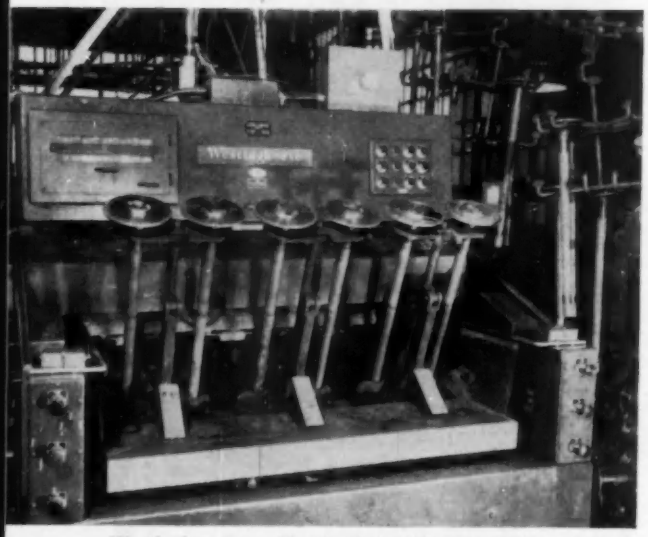
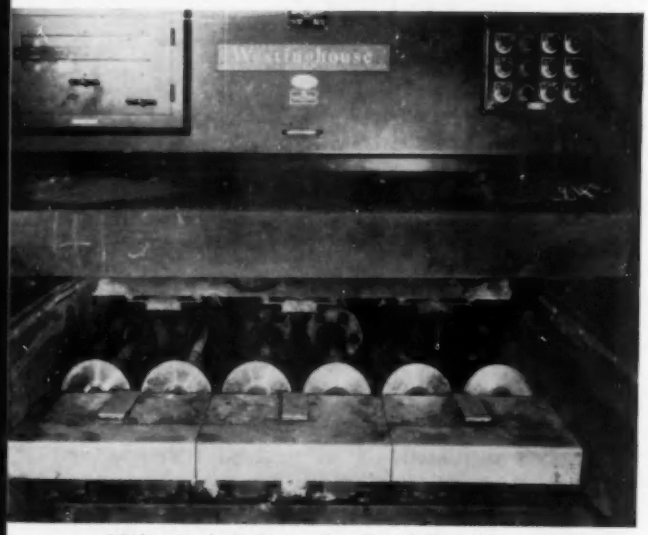


Diagrammatic section through the balancing station to show the detail of the adapter and air-ball pivot arrangement. The ball, near the top, is floated on an air film supplied from the air line below.

Machine loaded with six axle shafts. Operator is removing axles from conveyor at left



Westinghouse machine loaded with axle shafts ready to start cycle



With axle shafts lowered to "ready" position, quench rings can be seen around far end of axles; inductor coils behind quench rings

Induction Heating Equipment for Hardening Axle Shafts

High Fatigue Strength Achieved with Plain Carbon Steel at Ford's Chassis Parts Division

By J. Tauber, Ford Motor Co.
and
D. L. Lackey, Westinghouse Electric Corp.

THE Ford Motor Company's Chassis Parts Division, located near Detroit, uses induction hardening equipment for hardening rear axle shafts. A plain carbon steel, SAE-1038, is forged into a flanged axle having a tapered shaft approximately 28 in. long with a mean diameter of one in.

The induction hardening process hardens the surface of the shaft from the flange radius to the end. Surface hardness is 45 to 55 Rc. Hardening depth to the 50 per cent martensitic-line is 0.130 in.—0.150 in.

A six-spindle horizontal scanner is used to position the shafts in the inductor coils and quench heads. The axles are loaded manually into vertical loading fixtures and are then lowered automatically into a horizontal position. Next, the axles are picked up between centers, and the holding fixture moves down and out of the way. Work pieces are rapidly transferred to the rear of the machine where the inductor coils are then energized with 3000 cycle power. A heating time of 3.5 seconds and a delay with power off for 1.5 seconds are required to obtain the proper metallurgical pattern in the flange radius. The axles are then returned or "scanned" back to the front of the machine at the rate of 0.7 in. per second with the inductor coil energized with 3000 cycle power and the quench head spraying water on the heated shaft. The axle shafts are rotated during this entire heating and quenching cycle. The holding fixture brings the axles back to a vertical position for unloading and reloading.

Two operators are required to handle the two, six-spindle axle setups. Production obtainable from this combination is 420 shafts per hour. Current used is 600 kw at 600 cycles. The equipment is made by Westinghouse Electric Corp.

Induction hardening of the rear axle shafts has produced tougher axles that are said to have over twice the fatigue life of those made by the previous process. The use of plain carbon steel has also resulted in a dollar saving over the alloy steel formerly used. Other advantages are less floor space, better working conditions, elimination of caustic quench, and less distortion. The alloy axles previously used were machined in the range of 321-363 Brinell, while the plain carbon axles are machined in the range of 163-229 Brinell, resulting in a much greater tool life.

New Uses for Plastics
Discussed at SPI Meeting

Huge Growth of the Industry Brought Out at Exhibit and Technical Sessions of Reinforced Plastics Division of SPI

REINFORCED plastics, known in the industry as RP, for transportation equipment and production drew the spotlight at the 11th Annual Conference and Exhibit of the Reinforced Plastics Div., Society of the Plastics Industry, held last month in Atlantic City. The conference and exhibit pointed out the tremendous growth of the industry in new techniques, materials, designs, and standards.

A typical equipment development is a huge preforming machine and molding press which produce 15-ft boat hulls in one piece. One development which may come into use for passenger cars and trucks is a combination of RP with vinyl surfacing. This practice is currently employed by IBM for business machine housings. New loaded rovings and ropes are now being marketed which are the first steps toward automation in the molding of premixes for mass production of automotive components.

Last year RP fabricators used 49 million lb of polyester resins, and the industry foresees a 50 per cent growth for '56. In addition, there has been an increased use of other raw materials such as epoxies, low pressure phenolics, melamines, silicones, and fluoro-carbons. Reinforcements, in addition to glass fibers, include synthetic textiles, sisal, and asbestos. The industry figures it spent between $60 and $62 million for raw materials in '55.

In the automotive field, there was a great deal of interest in RP trucks, tooling, and car parts. Aircraft interest was in tooling, radomes, and airframe members.

Following are abstracts of three of the papers presented during the meeting:

Plastic Tooling

By Benjamin Sokol

Republic Aviation Corp.

Two of the factors that tend to retard the use of plastics for tooling are the high cost of the raw material and its lack of reclaimability. Formulated epoxy tooling resins vary from $0.60 to $2.00 per pound while tooling metals vary from $0.05 to $0.75 per pound. This, it can be argued, is an unfair comparison since there is so great a difference in densities between the plastic and the metal; therefore, for a given volume of tool the plastic could cost less. Taking this into consideration, a more equitable comparison might be on a volumetric basis in terms of cost/cubic foot of tool. When this materials factor is multiplied by a factor indicative of the relative tooling labor required, the resultant figure is an effective measure of the value of the material as a tooling medium.

From the table it is obvious that although glass cloth-epoxy laminates are known to have a high strength-to-weight ratio, their material cost is high. It is also apparent that the casting plastics cost less to work with because of the small amount of labor required in their use. In actual practice, combinations of metals and plastics are used in most plastic tools.

GENERAL COMPARISON of Common Tooling Materials*

Tooling Material	Material Comparison Factor ($/cu. ft.)	Labor Comparison Factor**	Resultant Comparison Factor ($/cu. ft.)
Aluminum	85	8	680
Kirksite	80	8	640
Steel (boiler plate)	35	12	420
Laminated glass cloth—epoxy	75	6	450
Unfilled epoxy (cast)	90	2	180
Phenolic (cast)	45	2	90
Heavily filled epoxy cast	20	2	40

* Basis: 1 cubic foot of tool, typified by a press block.

** This figure is dimensionless, based only upon the relative amount of labor required for grinding, machining or casting the tool.

A further consideration is the reclaimability of the tooling material. In the case of the metals, from partial to full value in reclaimability is possible. In the case of the thermo-setting plastics no reclaimability is economical. Thus a typical press block of four cubic foot volume, in kirksite would cost $880 and have a $300 reclamation value while the same tool in a cast epoxy would cost $400 but have no reclamation value. Both the kirksite and plastic require a plaster face pattern of the tool. The kirksite requires this for blue-blocking while the plastic is cast against it, so $120 was allowed for this in each tool. Therefore, from a pure cost-of-tooling viewpoint, there is little to choose between the two. However, as the volume of the tool increases, the kirksite tool will cost more due to the labor of grinding more tool surface while the cast plastic tool will increase only by

(*Turn to page 76, please*)

hind quench rings

PREVIEW of the 1956 Exposition of the ASTE . . . "TOOLING FOR TOMORROW" . .

ASTE Technical Sessions

MONDAY, MARCH 19

New Materials Day

Ceramic Cutting Tools
Titanium
Silent Sound Machining
Grinding
Shaped Diamond Tools

TUESDAY, MARCH 20

Research Day

Shaped Diamond Tools (2)
Automating Machines
Rent or Buy Machines?
Plastic Tooling
Professional Engineering
Tool Engineering Research
Carbide Dies

WEDNESDAY, MARCH 21

New Processes Day

Shaped Diamond Tools (2)
Fine Pitch Gears
Electronic Calculators
Jigs and Fixtures
Surface Finish
Automation

THURSDAY, MARCH 22

Management Day

Fluid Power (NFPA)
Cutting Research
Training Engineers
Maintenance of Tools

FRIDAY, MARCH 23

Tool Engineering Day

Designing for Competition
Standards
Tooling Large Presses
Lubrication

TOOLING for Tomorrow" is the theme of the 1956 Industrial Exposition of the American Society of Tool Engineers. The Chicago International Amphitheatre is to be the scene of the show and the Society's 24th Annual Convention, March 19-23. The Society's largest exhibition, with over 500 exhibitors, expects 40,000 registrants.

Co-sponsors with ASTE of several sessions of the conferences are National Tool and Die Manufacturers Assn., National Fluid Power Assn., and Armour Research Foundation. Sixty speakers are scheduled for the 26 technical conferences and panel discussions. A subject to receive close attention in five panels is the application of diamonds, natural and synthetic, in industry.

Included among the subjects of the technical program will be latest developments in the use of ceramic cutting tools. Advantages and limitations of ceramics will be discussed. The electronic calculator will be the subject of two papers.

Other subjects to be covered by technical papers and panel discussions include: working the "wonder" materials, new developments in grinding, automating individual machines, carbide dies, fine pitch gear production, jig and fixture design, fluid power, cost reduction through product and tool maintenance analysis, and tooling the world's largest presses.

Machine tools will occupy 22 per cent of all exhibits, making them the largest single category. None of these were shown at the Machine Tool Show in Chicago last September. Workholding devices, with 16 per cent of the exhibits are in second place, followed by inspection and quality control equipment (10 per cent).

Cutting tools, metal forming equipment, and drives and controls come next with about eight per cent each. Assembly equipment accounts for five per cent, and clamps and fasteners four per cent. Except for materials with four per cent, no other classification of industrial equipment exceeds two per cent of the total number of exhibitors, which fall into a total of 15 major categories and numerous sub-groups. Estimated value of all exhibits is $11,275,000.

Plant Tours—ASTE

MONDAY, MARCH 19

Meterola, Inc. 1:15 PM

TUESDAY, MARCH 20

U. S. Steel Corp. 8:30 AM
Armour Research Foundation 8:30 AM, 1:15 PM
Skil Corporation 1:15 PM

WEDNESDAY, MARCH 21

Ford Aircraft Div. 8:30 AM
Scully Jones & Co. 8:30 AM, 1:15 PM
Hotpoint Co. 1:15 PM

THURSDAY, MARCH 22

Kropp Forge Co. 8:30 AM
International Harvester Co. 1:15 PM
Electromotive Div., GMC, 1:15 PM
Sears, Roebuck & Co. testing laboratories 1:15 PM

FRIDAY, MARCH 23

Verson Allsteel Press Co. 8:30 AM

What's NEW at the 1956 ASTE INDUSTRIAL EXPOSITION CHICAGO MARCH 19-23

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 17

Three-Station Grinding Machine

Modern three-station machine for production chamfering of both edges of hypoid gear teeth.

A three-station grinding machine for burring and chamfering both the inside and outside edges of hypoid gear teeth will be introduced. This machine, plus latest developments in Burr-Master gear deburring and chamfering machines, will be on display.

Three ring gears are chamfered at a time on the grinding machine giving a production rate of 300 per hour. Two air-driven spindles mounting small grinding wheels for the deburring and chamfering operation are located at each work station. One grinding wheel chamfers the inside diameter while the other simultaneously performs the same work on the outside diameter.

Part holding fixture mounted on the work station spindle rotates continuously at a slow rate. After the operator places a part in position, he actuates dual start buttons located on opposite sides of each work station to raise the work into grinding position and lower the grinding heads. Upon completion of one revolution of the workpiece, the grinding spindle automatically is raised from the work and the part is lowered for unloading. All three stations function independently but identically to one another.

Various sizes of parts can be handled on this machine. By adjustments in the tooling a variety of straight and spiral bevel gears can be chamfered. *Modern Industrial Engineering Co. Booth No. 613.*

Circle 30 on postcard for more data

Cylinders, Boosters

Power cylinders featuring case-hardened, chrome-plated piston rods, "Teflon" rod wipers and hydraulic rod seals, and rust-resistant finish on other parts, will be displayed. A recent development of double-acting reciprocating boosters, which with shop air cycle continuously to supply a constant flow of oil for hydraulic cylinder operation, will also be shown. Likewise, a new threaded seal fitting that is said to eliminate leaks of oil, air, gas, water, chemical fluids, etc., at pipe threads and other threaded connections. *Miller Fluid Power Co. Booth No. 429.*

Circle 31 on postcard for more data

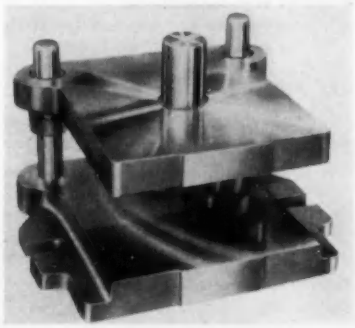
High-Speed Steels

High-speed steels, produced by a new processing technique, will be exhibited. It is said that the adoption of this process has resulted in high quality with the most consistent uniformity, assuring the tool maker of reproducibility within every bar from center to edge, end to end and shipment to shipment. Tools can thus be made having a more uniform response to heat treatment, size change and service life, and with a greater predictable performance. *Crucible Steel Co. of America. Booth No. 297.*

Circle 32 on postcard for more data

Die Sets

Shown will be a complete line of die sets and diemakers' supplies just announced. The company states this line makes available to diemakers a selection of die sets and supplies with a high degree of uniform and dependable accuracy and with a long service life. Precision lapped chrome-plated guide posts are standard in all precision units. All four horizontal surfaces, including the top of the punch holder, are ground to a high finish for accuracy in positioning. The sets are available in all standard sizes listed by the ASA, as well as in a broad range of other sizes. *Danly Machine Specialties, Inc. Booth No. 596.*



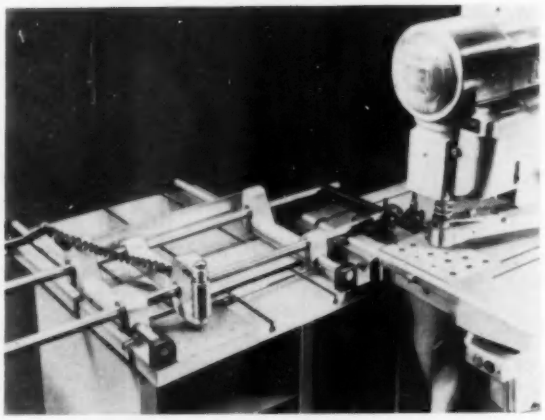
Danly die set.

Circle 33 on postcard for more data

What's NEW at the 1956 INDUSTRIAL ASTE EXPOSITION CHICAGO MARCH 19-23

For additional information, please use postage-free reply card on page 17

Duplicator for Punching Holes



Wales positive duplicator for locating holes and actuating punching mechanism.

Among several units to be exhibited will be the new duplicator, a pantograph-like mechanical device for locating holes in simple or complicated patterns and actuating the punching mechanism, from a template, by remote control. It is designed for use with the Wales Fabricator. As each hole is located the operator depresses the locator pin into the template aperture. This automatically closes a micro-switch in the locator assembly and actuates an air cylinder in the rear of the fabricator, which in turn operates the trip mechanism, effecting the punch.

A new tube piercing unit will also be shown, which can be used in either a press brake or punch press. Capacity is ½ to 1-in. OD tube; maximum punch diam 0.312 in.; maximum wall thickness of tubing 0.093 in. *Wales-Strippit Corp. Booth No. 379.*

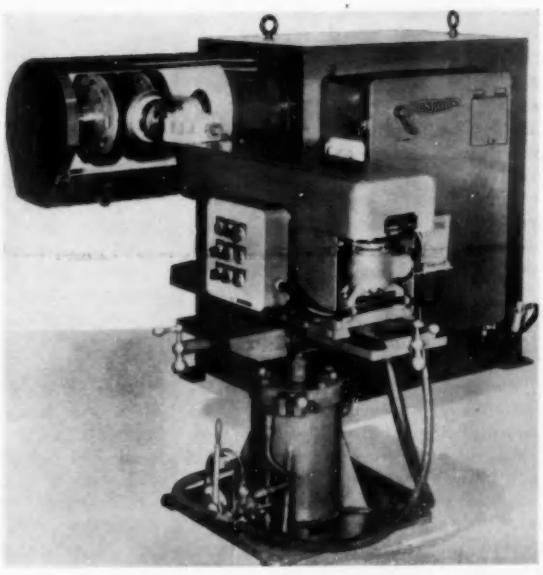
Circle 34 on postcard for more data

Deburring Machines

Power brushing methods for removing burrs, blending surface junctures and doing other brush finishing jobs, will be shown. In addition to demonstrating Brushamatic 3A machines, information and production data will be available on the 301 Series, new completely automated equipment designed for high speed production line work.

The Brushamatic 3A, is one of several semi-automatic brushing units. The operator simply loads and unloads, all other operations being predetermined and pre-set. The feeding and retraction of the work holder, and the rotation of the brushes are automatically controlled on a fixed time cycle to suit each application. *Osborn Manufacturing Co. Booth No. 466.*

Circle 35 on postcard for more data



This Brushamatic 3A machine is designed for gear deburring and finishing other metal parts.

Steel Cutting

Mechanized flame cutting of plain and irregular shapes from steel plate, employing the electronic eye tracer, plus a machining operation performed on shapes flame-cut from E-Z-Cut steel plate, will be features of the display.

E-Z-Cut steel plate is the company's newest leaded steel, intended for making die bases, jigs, molds, and other products in which considerable machining is involved. The machining operation will demonstrate the improved machinability of this steel plate over steel plate without the lead addition. *Joseph T. Ryerson & Son, Inc. Booth No. 1400.*

Circle 36 on postcard for more data

Epoxy Compounds

An entire exhibit will be devoted to end use examples of tools, dies, jigs and fixtures based upon the use of epoxy compounds formulated by the *Bakelite Co. Booth No. 397.*

Circle 37 on postcard for more data

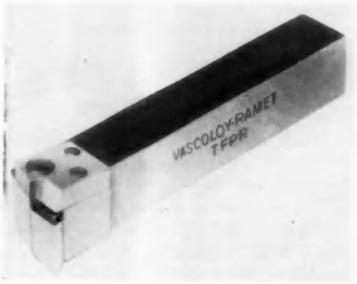
Silver Brazing

A high production silver alloy brazing job will be transplanted from a customer's shop to provide an active demonstration. Samples from other applications will also be displayed showing the joining of metals with Easy-Flo and Sil-Fos silver brazing alloys as well as Handy Flux. *Handy and Harman. Booth No. 275.*

Circle 38 on postcard for more data

Facing Tools

Displayed for the first time will be a new line of face mill cutters designed around the V-R elevator toolholder principle. They feature the use of throw-away carbide inserts which eliminate grinding. When the cutter is dull, all inserts are indexed to new cutting edges without the necessity of gauging each tooth to assure uniformity of the cutting edges. When the cutting edges are used up, the inserts are thrown away without re-grinding and a new set installed. These cutters will soon be available in 4, 6, 8 and 10-in. diam.



Vascoloy-Ramet facing tool.

Three new styles of 6-deg positive rake toolholders will be shown. Style TFPR and TFPL is a facing tool for use where positive rake machining is necessary for optimum results. This style employs the use of a triangular insert. Style SBPR and SBPL is for 6-deg positive rake turning with a 15-deg lead angle using a square throw-away insert. Style SFPR and SFPL employs the use of a square insert for 6-deg positive rake facing with a 15-deg lead angle. All three styles will soon be available in the most popular shank sizes. *Vascoloy-Ramet Corp. Booth No. 1137.*

Circle 39 on postcard for more data

Gear Gaging Machine

A unique Red Ring gear gaging and sorting machine, as well as a wide variety of broaches and broaching fixtures, will be featured in an exhibit.

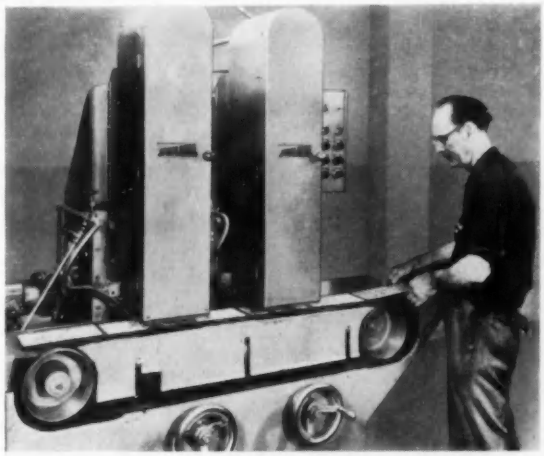
The model GRD gear gaging and sorting machine will be checking and sorting small automotive pinions automatically for tooth size accuracy. The machine will have a transparent plastic cover and mirror arrangement to show how the gage checks parts to tenths of a thousandth accuracy, sorts them according to undersize, oversize or 'OK' specifications, and shuts down a gear production machine if more than a given number of rejects of a specific type are successively produced.

Roughing and finishing broaches that produce internal helical involute gears without subsequent tooth finishing operations will be on display, along with a variety of other broaches. Red Ring shaving cutters will also be displayed. *National Broach and Machine Co. Booth No. 816.*

Circle 41 on postcard for more data

The Red Ring automatic gear gaging and sorting machine.

Multiple Head, Conveyor-Type Grinder



Engelberg-Huller model 680, two-head, conveyor-type abrasive belt grinder.

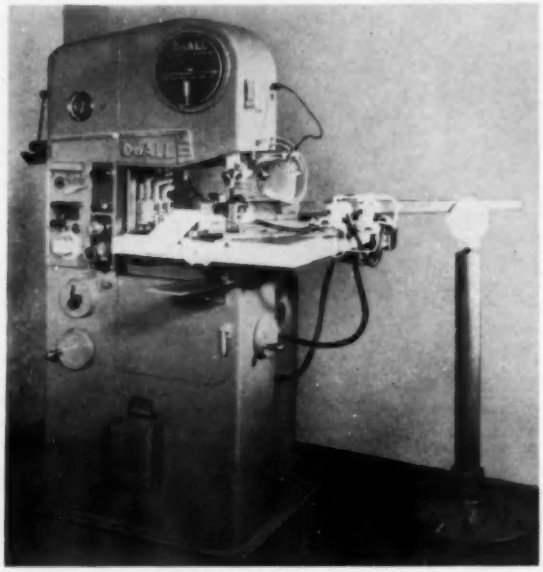
A new multiple head conveyor-type abrasive belt grinder will be shown for the first time. The Model 680 is designed for wet or dry grinding and polishing of ferrous, non-ferrous, plastic and other materials. It is said to be especially suitable for grinding and deburring flat surfaces on a high production basis. Multiple heads from two to six permit a simultaneous series of operations in the same time as a single operation. Unmachined parts can be processed with progressively finer belts to give a sized, uniform finish down to fine polishes.

The two-head model is 90-in. long, 51-in. wide and 90-in. high with an abrasive belt size of 6-in. by 80-in. Conveyor belt size is 7-in. by 144-in. Abrasive belt speed is 5500 sfpm, while speed of the conveyor belt varies from 5 to 30 fpm. The machine has a maximum piece capacity of 4-in. high, 6-in. wide, any length. *Engelberg Huller Co. Booth No. 1221.*

Circle 40 on postcard for more data

For additional information, please use postage-free reply card on page 17

Automatic Cutting Machines



DoALL model 16-3 band machine arranged for automatic angle cutting of stacked bars. Stroke of the hydraulic table and indexing stroke are synchronized.

Included in a large exhibit will be automatic angle sawing of stacked bar stock on a model 16-3 Contour-matic band machine. In this operation the stacks are indexed, the hydraulic feed table moves forward on the cutting stroke, and the cut pieces are ejected automatically.

High production machining of duplicate parts using fast loading fixtures will be conducted on the model 26-3 Contour-matic band machine. Demonstrations will show how many operations formerly consigned to other machine tools can be performed on the semi-automatic band machine using high-speed steel saw bands. Parts of diverse form and size will be shaped, slotted, notched, parted and trimmed in the booth to illustrate this new method.

An outstanding "first" soon to be announced will be presented. Called the Microtomatic precision slicing machine, it offers a practical method for parting and slicing extremely brittle, crystalline materials such as germanium and silicon.

Also demonstrated will be rapid cut-off operations with a power saw incorporating automatic indexing of stock, feed pressure control, and band tensioning, and infinitely variable tool speed control. *The DoALL CO. Booth No. 1520.*

Circle 42 on postcard for more data

Tooling Plate

Applications of light-weight magnesium tooling plate which have been developed in recent months, will be displayed. These fixtures are being used in the automotive and aviation industries. In addition, samples of the tooling plate available from the company and its mill products distributors will be shown. *Dow Chemical Co. Booth No. 362.*

Circle 43 on postcard for more data

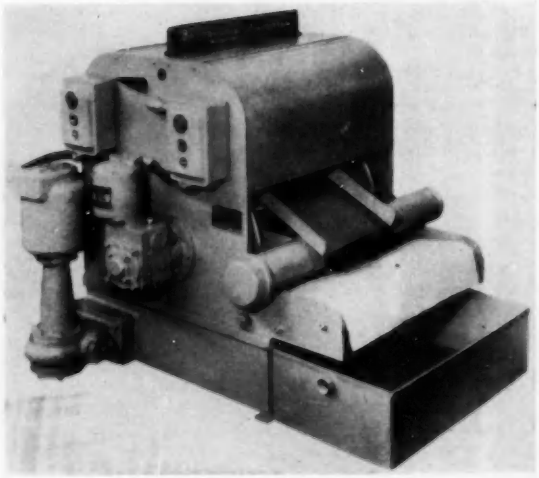
Coolant Filter

On display will be a representative model of combination magnetic and fabric filters. This model will be shown in an operating display, which will provide a continuous stream of contaminated coolant to the filter for cleaning. Show visitors will be able to observe the "two stage" cleaning action of this filter whereby the magnetic drum attracts and removes the major contaminant load, and fabric filtering media remove the remaining foreign material to provide a high degree of coolant clarity.

Also exhibited will be a line of high production honing tools and abrasives. The principal features of the H-S (slotted body) honing tools are the direct body support of the stone near the cutting face, and the full support of the expansion pressure to the stone.

Various types of drive adapters, stone holders, PLAS-T-CLAD abrasives of the full depth, skirt and clamp types, and a variety of sample parts will also be available for inspection by show visitors. *Barnes Drill Co. Booth No. 1127.*

Circle 44 on postcard for more data



Model MP-10-16-30 combination fabric and magnetic tank type filter.

Nut Runners

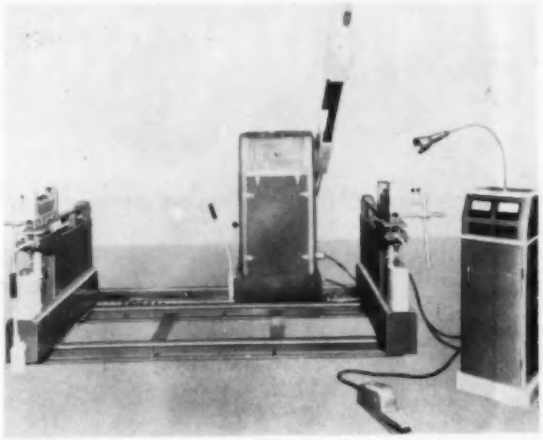
Visitors will witness and be encouraged to run nuts to a preset torque with the torsion bar torque control Impactools. They have multiple torque settings that are adjustable with the aid of a collar and tor-

Impactool 5040T.

que jig. The units shut off automatically when the preset torque is reached. Two sizes will be available for demonstration, a small one 5040T for torques up to 90 lb ft, and a heavy nut running tool 5340T for torques up to 550 lb ft.

A second innovation at the show will be a completely automatic multiple nut runner that assemblies connecting rods, presses in the bolts, feeds the nuts and runs them to a prescribed torque. *Ingersoll-Rand Co. Booth No. 345.*

Circle 45 on postcard for more data



Stewart-Warner Model 708 electronic industrial balancer

Large-Capacity Balancer

The large-capacity Stewart-Warner model 708 electronic balancer, just announced, will be demonstrated. It will dynamically and kinetically balance any rotor weighing as much as a 2½-ton locomotive traction generator, or as little as a one-pound flywheel. Some of the new features included are: Diametral range from 1 to 68 in. on any rotating piece; 1 to 5000 lb rotor weight capacity; 0.04 in.-oz kinetic sensitivity; 0.25 in.^{2}-oz dynamic sensitivity; and remote handle-controlled starting, braking and speed adjustment. *Merrill Engineering Laboratories. Booth No. 125.*

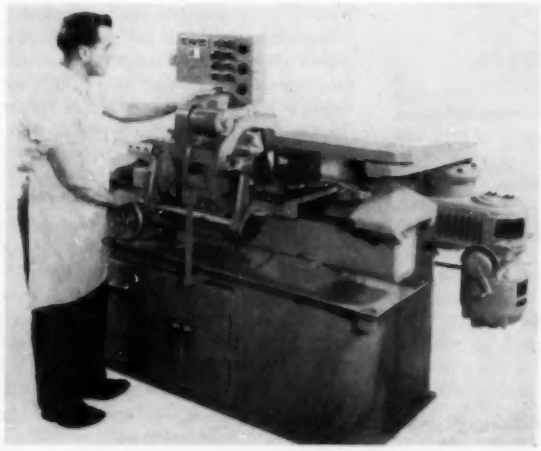
Circle 47 on postcard for more data

Tracer-Controlled Milling Machines

Two of the machines to be shown are special-purpose tracer-controlled milling machines, which utilize an original non-contacting tracer. The model 102 electronic airfoil milling machine produces irregular three-dimensionally contoured parts, such as jet engine blades, vanes and buckets, by copying a series of representative cross-sectional templates. A unique interpolating system is said to enable the machine not only to duplicate the cross-sectional templates, but also to generate the faired surfaces between and beyond these sections. The model 104 electronic template and cam machine generates external and internal contours on cams, templates, blanking punches and dies by following an enlarged conductive line drawing. A wide spindle speed range from 48 to 11,500 rpm permits milling in tough materials with large cutters, fast carbide milling, and also grinding operations.

Also demonstrated will be the model 105 airfoil measuring machine. It is said to provide a completely new, direct reading, single-operation method of inspecting airfoil contours on jet engine blades and similar shapes. *New England Tool and Machine Co. Booth No. 461.*

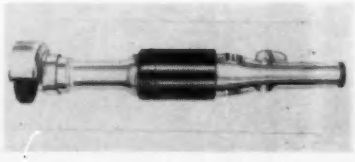
Circle 46 on postcard for more data



New England model 102 electronic milling machine.

Power Abrasive Tools

Model X-4 is the designation for a complete new line of portable, air-powered abrasive tools which will be shown for the first time and which



Buckeye series C horizontal grinder.

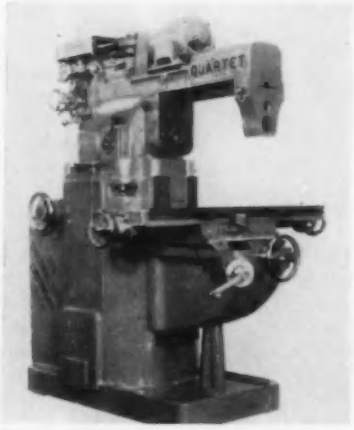
includes redesigned horizontal grinders and buffers, vertical grinders and sanders, and right angle sanders. Outstanding feature is an entirely new, highly sensitive governor which is said to enable the tools to develop greater power and to maintain higher speeds under load. X-4 models weigh no more and are no larger than previous models. *Buckeye Tools Corp. No. 113.*

Circle 48 on postcard for more data

For additional information, please use postage-free reply card on page 17

Milling Machines

Featured in one exhibit will be the new QUARTET milling machine, a horizontal universal knee type unit which may be used for horizontal, universal, vertical or angular milling operations. The unit is equipped with



U. S. Burke QUARTET miller

a turret which may be swiveled to accommodate the machine to universal milling operations. At the rear of the rectangular type overarm is mounted an independently driven vertical milling head, with power feed to the quill. For vertical and angular milling, the vertical head is indexed into position over the table.

Another new unit to be displayed is a vertical power-feed head milling machine. Feed rate of the head is infinitely variable from 0.002 to 0.008-in. per revolution. The machine features a completely enclosed hard chrome-plated quill, with 5½-in. of power travel and 800 lb of down thrust. *U. S. Burke Machine Tool Div. Booth No. 604.*

Circle 49 on postcard for more data

Drilling, Tapping Units

On display will be a drilling unit for deep hole drilling in crankshafts and camshafts. Drilling steps or increments can be preset to any depth multiples, and with a rapid approach and return need no further adjustment. Standard units have a 10-in. stroke.

Also shown will be a machine for automatic tapping. Features are rapid approach of tap to work, then tapping through lead-screw with locked-circuit feed and thrust control, then rapid return to start of cycle. Standard model 555 has 5-in. quill travel; capacity up to ⅞-in. in steel. *Drillmation Co. Booth No. 737.*

Circle 50 on postcard for more data

Miniaturization Precision Fasteners

Miniaturization will be featured as the theme in one of the exhibits. Copies of a booklet on the subject will be available and personnel will demonstrate some of the principles behind the concept of getting more from less.

High torque setscrews, high-strength wrenches for accurate tightening of socket head screws, and Hi-Ti titanium aircraft fasteners will be among the products displayed. Other products that will be shown include SPS micro screws and micro self-locking nuts, Unbrako cap and setscrews, Unbrako Dryseal-Thread hydraulic pressure plugs, Unbrako dowel pins, Sel-Lok spring pins, and Hallowell shaft collars. *Standard Pressed Steel Co. Booth No. 479.*

Circle 51 on postcard for more data

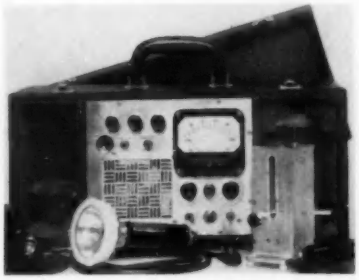
Rust Remover

Rustripper, the alkaline compound for removing rust, oxide scale, paint and shop soils without changing dimensions of precision parts or causing hydrogen embrittlement, will be displayed. According to the manufacturers, it may be used in hot or cold water solutions, with or without current, and with or without cyanide, and does not attack sound metal since action stops as soon as the rust has been removed. It is also said to provide temporary protection against rerusting. *Oakite Products, Inc. Booth No. 1325.*

Circle 52 on postcard for more data

Balancer, Testers

The Vibrodyne model 55 balancer, for balancing large machine assemblies and power station installations, will be in operation for the first time. It consists of one strobe light, a standard portable pickup, and an



Tinius Olsen balancer.

electronic amplifier with necessary cabling, all of which are enclosed in a suitable carrying case. This unit is capable of differentiating between the comparative amplitudes and various frequencies found in rotating parts or the vibration set up by these rotating parts. It is possible to determine the source of the disturbance as well as other frequency disturbances and their comparative amplitudes.

Also on display will be air-operated Brinell and automatic tensile testing machines. *Tinius Olsen Testing Machine Co. Booth No. 566.*

Circle 53 on postcard for more data

Multipress, Pumps

A new one-ton Multipress will be shown for the first time. The press has been designed for operations such as assembling, riveting, punching, marking, timing, pelleting, compacting, testing, straightening, broaching, swaging, etc., and to fit into automated lines working in conjunction with various types of feed mechanisms. The ram pressure of the unit can be set from 500 to 2000 lb. A dual electric control system insures safety as the unit will operate only when both hands are on the actuating buttons.

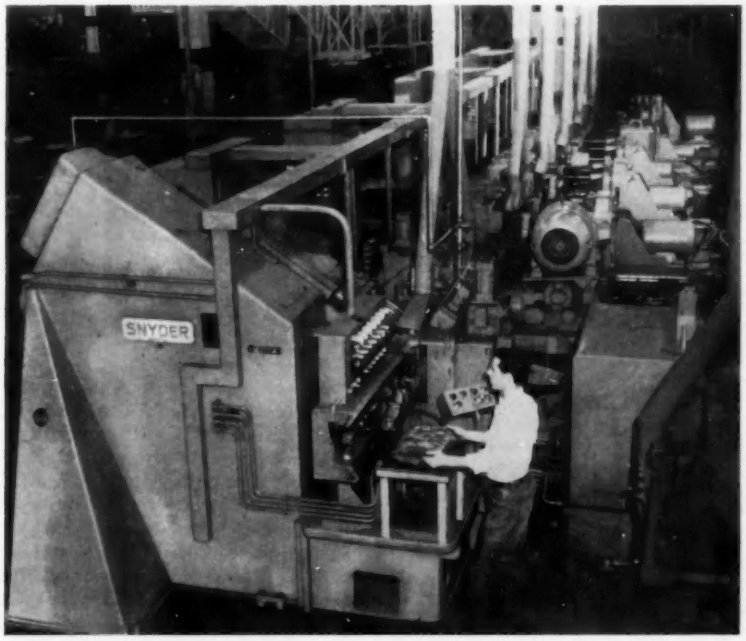
The company will also display its Multipump, and other lines of precision built pumps, motors and control equipment. The Multipump is a variable volume hydraulic pump of vane type construction incorporating in one unit flow controls, relief valves and the second pump used in dual pump circuits. *Denison Engineering Co. Booth No. 1706.*

Circle 54 on postcard for more data

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 17

Transfer Machine Mills, Drills and Taps



The Snyder segmented transfer machine for engine intake manifolds has a unique vertical angular rail arrangement.

A SEGMENTED transfer machine that includes a vertical angular rail arrangement to avoid turnover operations, and utilizes horizontal way units in the complete milling, drilling and tapping of a cast iron engine intake manifold, has been designed and built. By turning the intake manifold up on edge and transferring it from station-to-station with a transfer bar arrangement, all machining operations on the part are performed without turning it over. This design concept is said to reduce the overall length of the machine, avoid turnover fixtures, let chips fall away from the part by gravity, and to permit rugged horizontal way units to perform the machining operations.

The intake manifolds are transferred on vertical angular rails that travel the length of the hydraulically-operated electrically-controlled machine. Previously milled flat surfaces on the manifolds contact the rail surfaces. Retaining strips on top and bottom ways prevent the manifolds from falling away from the rails.

The manifolds are loaded on the vertical rails at station one and transferred to the second station where two holes are combination drilled and reamed and 16 holes are drilled with two eight-spindle heads. At station four, two pads are milled. Eleven holes are drilled at station seven. Two holes are spotfaced, one is core drilled and three holes are drilled at the eighth station.

At station 10, two holes are drilled and six holes are countersunk. The part is then transferred to station 11 where four more holes are countersunk. Three holes are drilled at station 13, and these same holes are countersunk at station 14. Seventeen holes are probed at station 16. If any of these holes have not been drilled correctly, the machine is automatically shut down before the part is advanced to the tapping stations 17, 19 and 20 where 20 holes are tapped. One hole which is pipe-tapped at station 20 is drilled at station 19 on the machine.

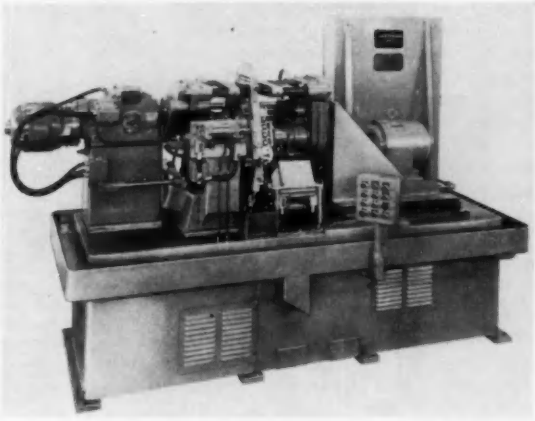
The seven-segment, 20-station, 54-ft long machine is designed for producing 68 manifolds per hour at 80 per cent efficiency. Features also include the use of individual control panels and hydraulic power units for each segment, and a master control panel. *Snyder Tool and Engineering Co.*

Circle 60 on postcard for more data

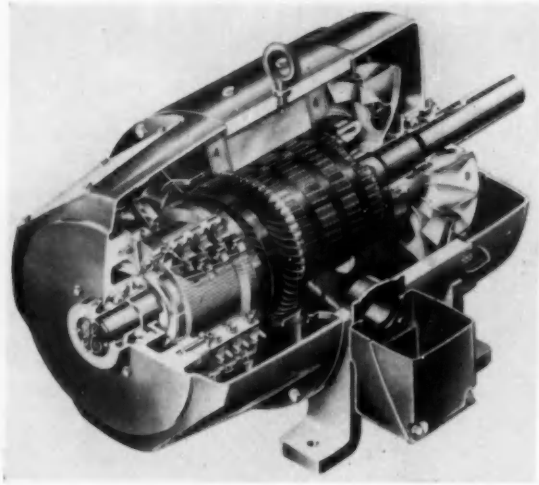
Indexing Machine Drills and Chamfers

This vertical, indexing type, drilling and chamfering machine employs one each cam feed unit and barrel cam feed unit. With quadruple loading, automatic clamping, unclamping and ejection, the machine drills and chamfers the pin hole of steering knuckles at a rate of 1600 parts per hour at 100 per cent efficiency. (Hartford Special Machinery Co.)

Circle 61 on postcard for more data



DC Motors and Generators



Design features of General Electric's Kinamatic motors are (A and B, respectively) exciting and commutating field coils insulated with mica, glass and other inorganic materials, with coils encapsulated in a heat-resistant polyester compound; (C) brush rigging, with brush holder yoke of heat- and - moisture-resistant polyester glass; (D) light-weight aluminum fan and improved ventilation system.

As the result of an engineering study to determine modern industry's drive requirements, an entirely new line of dc motors and generators has been introduced. Called the Kinamatic line, it is said to be the first complete line of industrial d-c motors and generators built to the latest NEMA standards for future design. Motor ratings from 1 to 150 hp and generator ratings from ¾ to 100 kw are available.

The motors have been designed for versatility and may be used in either constant or adjustable speed applications. Speed may be adjusted by either armature voltage control, field strength control, or a combination of both. New higher base speeds are available. For constant horsepower applications, higher top speeds can be obtained through field strength adjustment. The motor can also be applied where extra power at high speeds is needed. Through "forcing"—the application of over-voltage — many ratings can operate at proportionately higher speeds and horsepower. When properly applied, it can operate at any speed below base speed, including stalled torque. Faster speed of response is made possible by a reduction in armature inertia (WK^2) and electrical time constant permitting fast response for quick stops and starts and fast reversals and speed changes.

Class B insulation, a high volume fan and improved air flow enable a 15 per cent service factor in all standard dripproof Kinamatic motors. Users can take advantage of the service factor to obtain 15 per cent more than rated power continuously for normal life of the motor, obtain longer motor life at rated power, or to obtain greater versatility on speed and horsepower duty cycles.

Features have been incorporated in the design for ease of maintenance. Brushes are accessible through large hand holes. Ball bearings are packed with a lubricant which will last for long periods. Brass brush holders and molded polyester glass yokes are said to provide a rugged, corrosion-resistant brush rigging assembly. *General Electric Co.*

Circle 62 on postcard for more data

Rod Bending Machine

Two bends in each end of steel rods at rates up to 960 rods per hour can be produced in an automatic bending machine. It has a mechanically operated rotary index drum that indexes rods from a feed chute to two bending stations. Inner and outer bends are produced in each rod end by bending dies powered by single-rotation, hydraulic rotary actuators. Finish-bent rods are carried out of the machine by a roller chain conveyor.

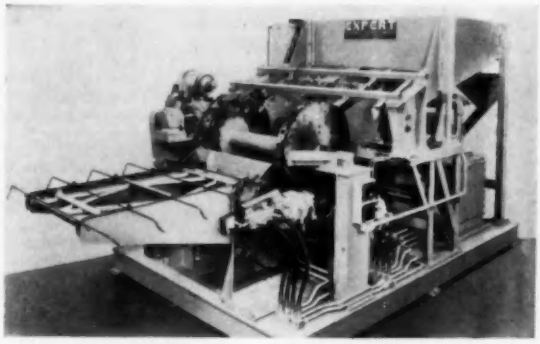
The rotary actuators are adjustably mounted, enabling a wide variety of bend angles to be produced in each bend, as well as assorted plane relationships between the two bends in each rod end. Width of the index drum and machine size depend on the diameter and length of rod stock to be bent.

Rods to be bent are placed in a feed chute where they slide by gravity to a position ahead of the drum index. They are picked up one-at-a time and clamped by spring - loaded toggle clamps on the periphery of the drum. These toggle clams, which are opened by cams at the drum loading station, grip the rods firmly near each end throughout the index and bending operations.

A motor-driven cam index mechanism transfers the rod to the first bending station where the outer bends are produced on each end by the rotary actuator-powered dies. Then the rods are indexed to the second bending station where the inner bends are similarly produced on each end, completing the bending operations. The bent rod is then indexed to the third station where it is stripped from the drum and deposited on a roller chain conveyor.

Each of the four rotary actuators that power the bending dies are slide-mounted and moved in and out of bending position by a hydraulic cylinder. The actuator and slide assemblies are cradle-mounted to provide adjustable bend angles and plane relationships. *Expert Automation Machine Co.*

Circle 63 on postcard for more data



The machine illustrated bends ⅜-in. dia, 5-ft long heat-treated spring steel rods to form automotive trunk lid torsion bars at a rate of 960 rods per hour. Two bends of approximately 90 deg are formed on each end of the rod. One bend has a leg ¾-in. long

Timing Motors

ANNOUNCED is the development of a new series of chronometrically governed DC timing motors to provide the accuracy of an escapement clock and the power of an electric motor.

These motors keep rate independent of load, line and temperature variations. Power pulses at full line voltage are applied to a small motor at intervals controlled by a jewelled escapement, with the pulse duration determined by travel of the motor. This method holds motor travel constant during each time interval regardless of load (within rating). As a result beat rate is held constant within ±0.1 per cent for line voltage variations of ±20 per cent and load variations from zero to full load. Standard escapements are 300-beat and 900-beat types giving 150 or 450 complete oscillations per minute.

Motors are supplied in conventional form with self-contained gear reduction and output shaft. Weight is 7.5 oz. These timing motors are for service in automatic controls, timers, time-delay relays, repeat-cycle timers and computers where the mechanism must do the work in driving charts or in operating contacts, cams and actuators. *A. W. Haydon Co.*

Circle 64 on postcard for more data

Conveyor Drive

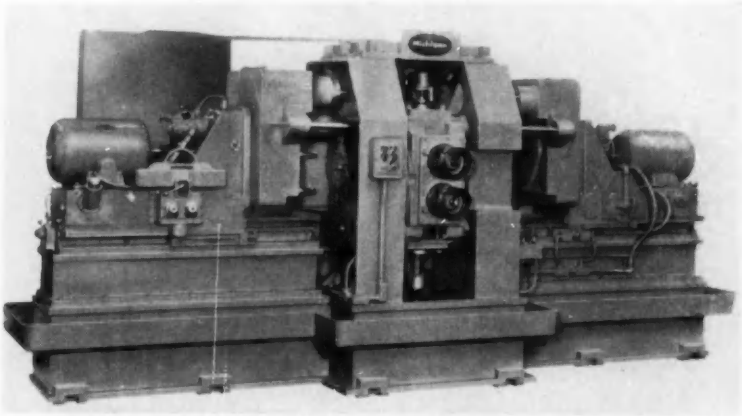
THE HVUT speed reducer has been developed specifically for application to conveyor drives and features mounting flexibility, wide range of output speeds and rugged construction. It may be mounted in any one of six different positions. The output shaft when mounted in the vertical-down position is a typical installation for overhead conveyors such as used in the automotive industry. The "dry well" feature of the reducer provides a completely dry area around the output shaft and avoids the possibility of oil leakage down the shaft. A large volume of oil circulates to keep the reducer cool; bearing in dry well is grease-lubricated. The output shaft vertical-up is employed for tow line and other types of conveyors. Dust-proof housings make pit mountings feasible.

Utilizing the standard 50 to 1 worm gear reduction, total ratios between 50 to 1 and 1800 to 1 can be realized with standard stock helical gearing, while lesser or greater total ratios are available with special worm gear sets. Speed change is said to be easily accomplished by simply replacing the helical change gears with the desired ratio.

Mechanical-electrical shut-off device for torque or overload control is optional. It protects both the reducer and conveyor by instantaneously stopping the conveyor system at the moment any overload occurs. This control is adjustable in the field to suit varying service conditions. *Philadelphia Gear Works, Inc.*

Circle 65 on postcard for more data

High-Production Boring Machine



Built to rough bore and semi-finish bore compressor housings, this double-end, four-station, trunnion-type machine, using carbide tools and feeding at the rate of 11-in. per minute, will handle 420 housings per hour. Mounted on each of two standard HC-10 units are the four-spindle, heavy-duty boring heads. The way-type feed units are self-contained.. Parts are power clamped. Automatic index table is hydraulically-operated. (Michigan Drill Head Co.)

Circle 66 on postcard for more data

Air for Instruments

LOW-FLOW centrifugal compressors for furnishing clean oil-free air for use in instrument air systems and for process air are offered. Flows are as low as 350 scfm delivered at 65 psi abs. Unit with 150 hp motor is capable of flows to 750 scfm at 65 psi abs.; additional models 83A, 86 and 86A from 750 scfm to 2000 scfm at same discharge pressure. These compressors are also available at reduced discharge pressures. *Sawyer Bailey Corp.*

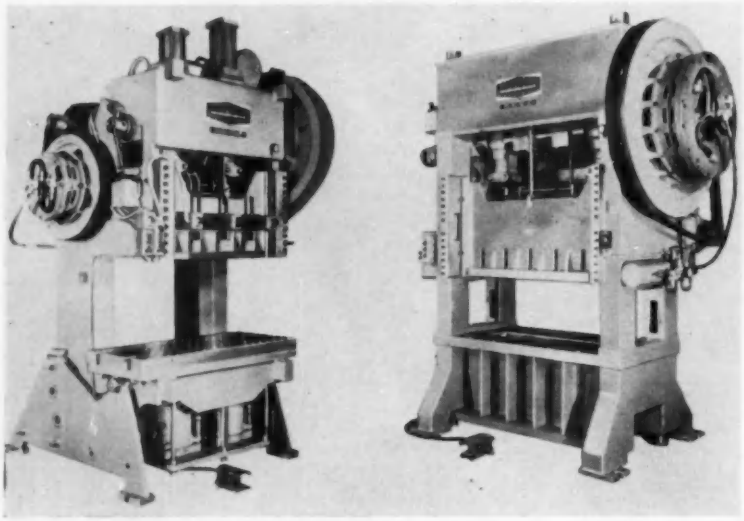
Circle 67 on postcard for more data

Bench and Instruments for Testing

This new type of bench for testing and quality control makes it possible to arrange each instrument on the unit in any combination to facilitate a vast variety of required testing or measurements. Instruments are available for the measurement of speed in rpm or cps; time intervals as small as 10 microseconds; air pressure, voltage, current, resistance; voltage break-down of insulating materials; etc. The bench is wired to provide special power requirements in both ac and dc currents. (Performance Measurements Co.)

Circle 68 on postcard for more data

Two Lines of Double Crank Presses



Shown at left is the Johnson 60-ton model of double crank press, with a 56 by 22-in. bed size. At right is the 80-ton model of this series with a 52 by 30-in. bed.

Two double crank press lines, both featuring box-type rams, large bed areas, low inertia clutches and electrical controls, have been announced.

The new straight side series is available in 30, 40, 60, 80, 100 and 150 ton capacities. These are high speed blanking flywheel type presses with variable speed drives up to 300 strokes per minute, or back geared presses for drawing, forming, punching or piercing jobs. Shown is the 80 ton model with a 52 by 30 in. bed. It has a 48 by 30 by 3½ in. bolster plate, 48 by 24 in. ram face and a bed opening 36 by 6 in. The crankshaft has a two-in. stroke and the shut height over bolster is 18 in. It has a three-in. slide adjustment and performs at the rate of 60 strokes per minute.

Other construction features are tie rod construction, Bijur automatic lubrication, air counterbalance, Wichita air clutch, air actuated spring set brake, rotary limit switch and electrical controls, including selector switch for single and continuous stop at top, jog, emergency stop and one or two hand palm buttons and/or foot control.

The second series of presses now being introduced is known as the G-2 Series and is a line of Double Crank capacity presses. These are offered in 60, 80, 100, and 125 ton capacities.

Also shown is the 60 ton model of this series with a 56 by 22-in. bed size. It has a bed opening 28 by 10 in. and a ram face 40 in. by 22 in. The speed of the backshaft is 303 rpm. The geared model makes 50 strokes per minute, whereas the flywheel press operates at 100 strokes per minute. The depth of the throat is 12 in. and opening through back of bed is 36 in. The standard bolster thickness is 3 in. This press has a 2½ in slide adjustment. The shut height at top of bolster is 12 in. and the maximum stroke is 8 in. with the standard stroke being 3 in.

Certain variations of specifications are optional at additional cost. For instance, the strokes per minute, the die space, speed of motor, thickness of bolster, stroke of crankshaft, and electrical controls may be varied.

The G-2 series has Wichita air clutch, air actuated spring set brake, and air counterbalance. This model is drilled and tapped for air die cushion. It is motorized and provides selector switch for single or continuous operation. *Johnson Machine & Press Corp.*

Circle 69 on postcard for more data

Template File

Templa-File is a new system for filing and storing templates, patterns, wiring diagrams, visual plant layouts and stock materials. The unit contains 24 numbered sliding panels, 36 by 80 in., individually roller suspended on overhead channel tracks. Each panel can support 600 lb. of hanging weight. The entire unit has a storage capacity of 2880 sq ft of templates, patterns or gaskets. For storing, metal pegs are provided for bolting into the panels in holes on six-in. centers. A record and reference desk, with swing-out tabulating card file, is built in. Dimensions of the unit are 9 ft 6 in. wide by 2 ft 7 in. deep by 7 ft 3 in. high and it occupies less than 25 sq ft of floor space. *Deluxe Metal Furniture Co.*

Circle 70 on postcard for more data

Precision ID Gages

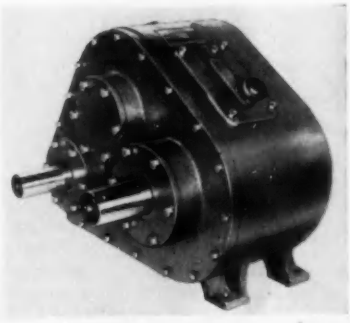
Kwik-Chek gages, available in three sizes, sold individually or in sets, measure the inside diameters of round holes by utilizing a sliding shaft and precision locking device that are said to permit fast and precise readings, accurate to the nearest 0.0005 in. Gage 20 can measure round holes of from 0.020 to 0.130 in., gage 30 from 0.130 to 0.255 in., and gage 40 from 0.255 to 0.380 in.

According to the announcement, other types of gages will be added to the line in the near future by this company which is just now entering the high precision gage field. *Hamilton Watch Co.*

Circle 71 on postcard for more data

Transmission

Introduced is a transmission with two speed changes (overdrive or reduction) and neutral, a capacity of



Western transmission

360 hp at 1800 rpm input, and a maximum reduction of 7.75 to 1. It is identified as model 9400. Torque rating is 12,600 lb in. input. Input and output shafts may be from the same or opposite sides. Weight is approximately 600 lb. *Western Manufacturing Co.*

Circle 72 on postcard for more data

Vertical Milling Machine

FEATURES hitherto unavailable in the field are said to be offered in a vertical milling machine recently announced. An infinite speed drive provides feed from 80 to 570 rpm in low range, and 584 to 3800 rpm in the high speed range with no belt changes. A built-in tachometer indicates the spindle speed to the operator.

The infinite quill feed provides any desired power feed to spindle from 0 (neutral) to .008 in. The control of the quill feed facilitates obtaining correct depth when blind drilling to a given depth. Moving the quill feed control lever to neutral position, for example, stops the spindle feed, making it unnecessary to stop the spindle. A positive clutch in the center of the quill hand wheel also provides instant quill feed control.

The ground table has a 36 by 9 in. working surface. The range is 18 in. longitudinal, 10 in. transverse, and 16⅝ in. vertical. The spindle nose is collet chuck type. The head can be swiveled 360 deg. *Logan Engineering Co.*

Circle 73 on postcard for more data

Six Circuit Control

FEATURED is a new snap-action switch that gives control of six circuits simultaneously from a single actuation. The triple-pole switch, model K3-4, simultaneously reverses the current flow through two windings of a three-phase motor up to one hp and is also for other types of multi-switching installations. The action of the three poles is independent of the speed of actuation, making it usable on installations where even extremely slow moving cams are used. A large selection of standard actuators are available. Electrical rating is 15 amp at 125/250-v ac; 15 amp at 30-v dc res. *Electro-Snap Switch and Manufacturing Co.*

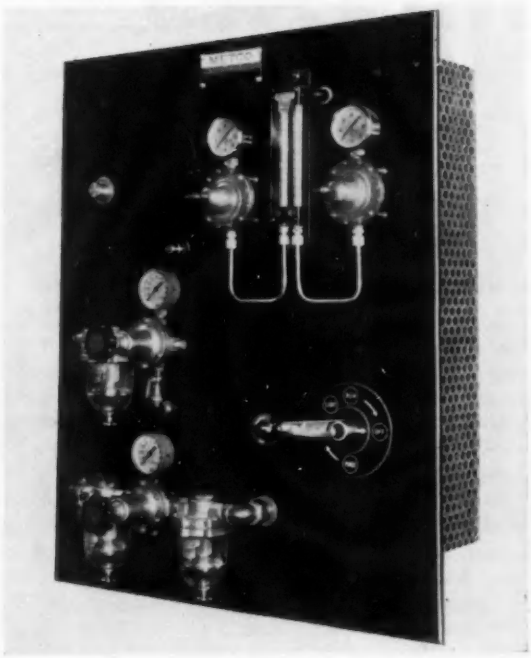
Circle 74 on postcard for more data

Tank Coating

RUBBAKOTE, a liquid rubber coating for preventing corrosion in electro-plating tanks, is said to be self-vulcanizing, unaffected by acids and alkalis, and to adhere to all types of metals. It can be applied by brush or spray and dries within 30 minutes after application. *Rubba, Inc.*

Circle 75 on postcard for more data

Automatic Metal Spraying



The type CP control panel recently introduced automatically opens gas valves, lights gun and starts wire feed, making possible an automatic metallizing production line. After once setting gas, oxygen and air controls and wire feed, the operator then stops, and starts the spraying operations with a turn of the control handle. Without disturbing adjustments, the operator can light, run, stop and relight as often as the production run requires. (Metallizing Engineering Co., Inc.)

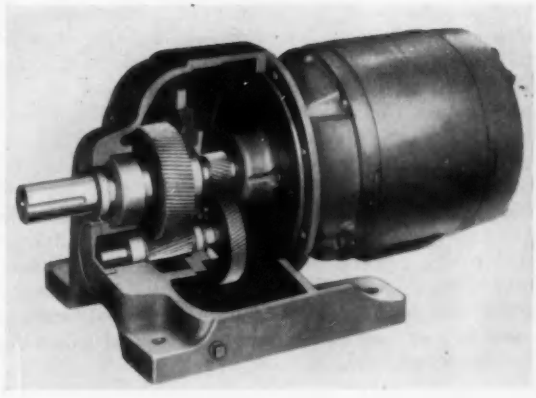
Circle 76 on postcard for more data

Gearmotors and Motogears

A LINE of Gearmotors and Motogears, in keeping with new NEMA motor sizes which deliver more horsepower per pound, has been introduced. Compactness is said to be achieved through an unique arrangement of hardened gears. Ratio changes are simplified through the use of one low-speed gear set per drive size. Oil-tight design is facilitated by means of a one-piece housing with just an input cover and two shaft openings. An integral, positive-locking backstop is available.

These units are rated in accordance with AGMA standards. The Gearmotors range up to 30 hp., and the Motogears up to 60 hp. Output speeds range from 280 rpm down to 6 rpm. Type DF double reduction Gearmotors have ratios from 6.2 to 1 through 31.4 to 1 and transmit up to 30 hp. Type TF triple reduction units have ratios from 38.4 to 1 through 292 to 1 and transmit up to 20 hp. Type DB double reduction Motogears have ratios from 6.2 to 1 through 38.4 to 1 and transmit up to 60 hp. Type TB triple reduction have ratios from 47.1 to 1 through 292 to 1 and transmit up to 20 hp. *Link-Belt Co.*

Circle 77 on postcard for more data



Phantom view of Link-Belt Gearmotor, part of a completely new line recently announced

METALS

Many Users Expect to Have Higher Steel Inventories. More Aluminum Capacity Planned. International Tin Agreement Signed

By William F. Boericke

Over-All Steel Demand Continues

Some steel men now confess rather ruefully that the cutback in orders for steel from Detroit was sharper than they expected. But demand from the automobile manufacturers may soon head up again, probably in May or June, when supplies will be wanted for the new car models expected to be introduced earlier than usual.

No one admits that steel demand has turned sour at this time. At mid-February production was near capacity, with ingot output scheduled at 97.6 per cent, down only a small fraction from 100.4 per cent in January. That month saw more steel produced than any month in history. Most steel executives declare there has been no decline in overall demand, with incoming order volume still at production level. Backlogs are good, equal to three months capacity operations. Aside from automobiles, no other consuming industry has reduced buying.

Yet there are problems. While one consumer increases orders as another drops out, it may be for a different kind of steel, and the job of the manufacturer is to switch semi-finished steel into the needed product, sometimes very difficult to do. A rolling adjustment is underway. The frenzied bidding for cold rolled sheets that characterized 1955 disappeared when Detroit gave up efforts to corner the market. Taking first place now on the buyers' list are plates and structurals, urgently needed by the freight car builders and the construction industry.

A survey of users indicates that a considerable proportion expect to have higher steel inventories 90 days ahead. This suggests that many steel consumers regard steel as money in the bank and with good reason. If a strike should occur next July, they want to be fully protected. If a wage increase should be granted, they know it will be immediately passed on to consumers in a higher price for steel, just as happened in 1955, when an across-the-board hike of $7.35 per ton followed the wage settlement. Finaly, they fear that an advance in basic steel prices may not even wait for Juiy. Already recent revisions in extras for hot and cold rolled sheets have added about 3-5 per cent to list prices for some producers and the move may become general. Steel executives have emphasized that higher prices and better profit margins must be obtained to meet the high cost of expanding the industry's capacity.

Alloy Steel Sales Lower

Manufacturers of alloy and stainless steel have been more affected by lower automobile production than the integrated companies. The motor industry takes a larger percentage of alloy steel production than of the overall steel output and new customers to replace the automobile manufacturers are not so easily found for the high priced specialty steels. In 1955, stainless producers had an extremely good year, with production up 40 per cent. More might have been used if nickel had been more plentiful, but present conditions don't favor any easing in the nickel supply, and a price increase would surprise no one.

Copper Still in Tight Supply

Hopeful estimates that the copper scarcity would be measurably relieved before the end of the second quarter seem doomed to disapointment. As has happened before, estimates of increased supply have been invalidated by strikes at producing plants. Work stoppage at the important Laurel Hill refinery of Phelps Dodge cost 12,000 tons of copper by mid-February, and the loss of 31,000 tons from the Chile shutdowns has further tightened supply, although the Chilean mines are now back in production.

As a result copper is hard to obtain for prompt delivery and market prices reflect it. The big producers hold steadily to 43 cents per lb, but custom smelters, to whom consumers must go for additional metal, qute 52 cents. The foreign market is a trifle easier, with the Rhodesian Selective Trust holding at 45 cents, although the metal on the London Metal Exchange is about 5 cents per lb higher.

The high prices meet with little favor from the major copper producers, who do not have much faith in their permanency. Speaking before the National Industrial Conference, a top Kennecott official predicted the price would not be below 30-35 cents per lb in the near future, which must furnish cold comfort to those who expect the present price level to continue indefinitely.

In somewhat similar vein, the chairman of an important Rhodesian producer expressed considerable concern over the effect that high prices were having on substitutes gaining important markets at copper's expense. He pointed out that European consumers were becoming definitely cost-conscious and were looking critically at other metals, notably aluminum, without regard to engineering qualifications. However, the high cost of changing over from one metal to the other as well as the near certainty that the

(*Turn to page* 84, *please*)

SCHWITZER CORPORATION
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SUPERCHARGERS
TURBOCHARGERS
DAMPERS
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SCHWITZER CORPORATION

News of the MACHINERY INDUSTRIES

By Thomas Mac New

Attempts Being Made to Clear Up New Policy, Released by the Department of Defense, on Buying of Machine Tools by the Government

ODM to Check "Buck Passing"

A parade of witnesses appeared before the Senate Small Business Committee and its subcommittee on Relations of Business with Government last month to give their views on the Government's machine tool buying program. One of the first steps taken by the Committees, headed by Senator John Sparkman (D., Ala.) and Senator Edward J. Thye (R., Minn.) respectively, was to attempt to clear up the new policy released by the Department of Defense.

According to Arthur S. Flemming, Director of the Office of Defense Mobilization, the new program is just another method of implementing the original Vance recommendations. Vance had originally recommended, back in 1953, that the Government make substantial annual expenditures for machine tools to build up a reserve of production equipment and also have a healthy machine tool industry. Flemming believes that the new ODM setup will do a more complete job if the services have an opportunity to request and justify all the funds needed each year for machine tools, rather than dividing one established fund. Thus, the Defense Department will have an opportunity to review each service's tool buying and modernization program, and the congressional appropriations committees also will have a chance to review the recommendations. In addition, Flemming states that ODM will require periodic reports on machine tool inventories and buying programs to see that they are moving as planned. Probably the most interesting statement made by Flemming during the interview was that ODM will make sure that there will not be any "buck-passing" under the new program. This is something that the writer would like to see work in industry as well as Government.

The Senator is Skeptical

Senator Sparkman was very critical of the Defense Department for failing to spend the $100 million appropriated in each of the last two years, and particularly the Air Force for turning back its $84 million this year while admitting that more and newer tools are needed. He also pointed out that Congress wouldn't have any assurance that machine tools for future capacity will be purchased when funds are hidden in the Services' general appropriation, as proposed by Flemming. Senator Sparkman believed that taking away the separate fund will in effect cut down machinery purchases.

Harold S. Vance replied to the Senator that there would be no cut-back "if properly administered." According to Vance's testimony, the original Vance committee report specified tool buying programs budgeted by each service and not the separate fund used by the Defense Department in recent years. He pointed out that preparedness plans have changed to a point where, in event of war, military equipment would have to be produced immediately instead of depending on shelf machines which may not have an opportunity to get into production.

Flemming pointed out that a major stumbling block under the lump sum system, backed up by Defense Department attorneys, is that funds are limited to shelf tools only. The new concept calls for both shelf capacity and production line equipment. "More funds should be spent under the new system," Flemming testified.

Reserve Fund

The Assistant Secretary of Defense, Thomas Pike, for Supply and Logistics, stated that he will ask Congress to permit the Department to set up the unspent $100 million as a reserve fund for machine tool buying for current production needs. In defense of the Air Force, he reported that $60 to $65 million has been spent by that branch of service this year out of its general funds, even though it turned back the $84 million from the special fund.

(*Turn to page 84, please*)

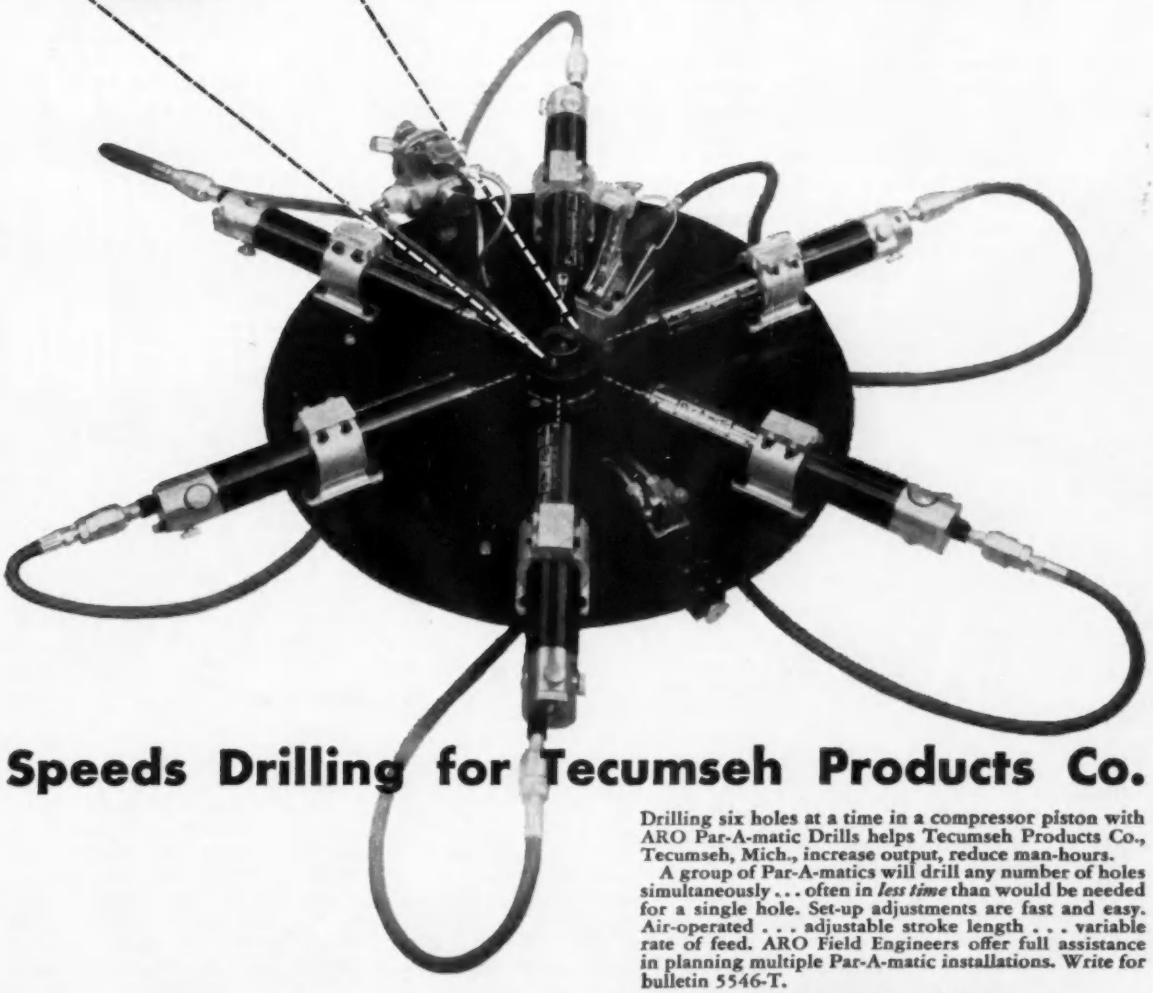
Total United States Stocks of Elephant Tools by Type and Condition

Types of Tools	Total U. S. Stock	CONDITION Good No.	Good %	Fair No.	Fair %	Poor No.	Poor %	Unknown No.	Unknown %
Horizontal Boring Machines	245	164	66.9	62	25.3	11	4.5	8	3.3
Vertical Boring Machines	140	68	48.6	49	35.0	18	12.8	5	3.6
Radial Drills	108	67	62.0	16	14.8	3	2.8	22	20.4
Gear Generators, Hobbers Shapers and Shavers	287	150	52.3	64	22.3	22	7.7	51	17.7
Cylindrical Grinders	39	25	64.1	9	23.1	5	12.8	0	0.0
Lathes	228	115	50.4	69	30.3	30	13.2	14	6.1
Milling Machines	28	14	50.0	13	46.4	1	3.6	0	0.0
Planers	175	74	42.3	75	42.9	17	9.7	9	5.1
Plate Edge Planers	65	26	40.0	26	40.0	6	9.2	7	10.8
Shapers, Draw Cut	45	22	48.9	17	37.8	6	13.3	0	0
Slotters	20	6	30.0	9	45.0	2	10.0	3	15.0
Bending Rolls	20	14	70.0	3	15.0	3	15.0	0	0.0
Bending and Forming Machines	10	6	60.0	2	20.0	0	0.0	2	20.0
Press Brakes, Power Driven	102	69	67.6	6	5.9	0	0.0	27	26.5
Presses, Hydraulic	179	115	64.2	19	10.6	5	2.8	40	22.4
Presses, Mechanical	84	59	70.2	14	16.7	1	1.2	10	11.9
Other Types	49	25	51.0	21	42.9	3	6.1	0	0.0
TOTALS	1824	1019	55.9	474	26.0	133	7.3	198	10.8

Total United States Stocks of Elephant Tools by Types and by Government and Private Ownership

Types of Tools	Total U. S. Stock	Privately Owned No.	Privately Owned %	Government Owned No.	Government Owned %
Horizontal Boring Machines	245	147	60.0	98	40.0
Vertical Boring Machines	140	113	80.7	27	19.3
Radial Drills	108	65	60.2	43	39.8
Gear Generators, Hobbers, Shapers and Shavers	287	142	49.5	145	50.5
Cylindrical Grinders	39	34	87.2	5	12.8
Lathes	228	150	65.8	78	34.2
Milling Machines	28	27	96.4	1	3.6
Planers	175	139	79.4	36	20.6
Plate Edge Planers	65	48	73.8	17	26.2
Shapers, Draw Cut	45	40	88.9	5	11.1
Slotters	20	17	85.0	3	15.0
Bending Rolls	20	20	100.0	0	0
Bending and Forming Machines	10	8	80.0	2	20.0
Press Brakes, Power Driven	102	34	33.3	68	66.7
Presses, Hydraulic	179	41	22.9	138	77.1
Presses, Mechanical	84	14	16.7	70	83.3
Other Types	49	44	89.8	5	10.2
TOTALS	1824	1083	59.4	741	40.6

AUTOMATION WITH ARO PAR-A-MATIC DRILLS



Speeds Drilling for Tecumseh Products Co.

Drilling six holes at a time in a compressor piston with ARO Par-A-matic Drills helps Tecumseh Products Co., Tecumseh, Mich., increase output, reduce man-hours.

A group of Par-A-matics will drill any number of holes simultaneously . . . often in *less time* than would be needed for a single hole. Set-up adjustments are fast and easy. Air-operated . . . adjustable stroke length . . . variable rate of feed. ARO Field Engineers offer full assistance in planning multiple Par-A-matic installations. Write for bulletin 5546-T.

THE ARO EQUIPMENT CORPORATION
Bryan and Cleveland, Ohio

Aro of California, Los Angeles 7, California
Aro Equipment of Canada, Ltd., Toronto 15, Ontario
Offices in All Principal Cities

IN ACTION
AT THE ASTE SHOW
BOOTH 638

See the new ARO Par-A-matic and automatic drills . . . the new multiple nutsetter . . . the new link chain hoist and other ARO tools.

ARO **AIR TOOLS**

Also . . . AIR HOISTS . . .
LUBRICATING EQUIPMENT . . .
AIRCRAFT PRODUCTS . . .
GREASE FITTINGS

Observations

By Joseph Geschelin

Labor Problems

There has been considerable discussion of late concerning the role of automation in meeting the labor shortage looming in the next decade. Apparently, this need already is felt overseas. We attended a press preview recently of a battery of presses, linked with automation for making wheels for Dunlop of England. Their representatives reported that an expansion in wheel production would not have been approved by the government if it implied the need for more labor. The automation equipment, capable of meeting the increased demand without requiring additional labor, was the only thing that turned the tide. If this is indeed a problem in European countries, there should be a big market for the advanced types of machine tools currently developed in the USA.

Inert Arc

Inert arc welding is widening in its applications in automotive parts plants. One major installation is in a large plant producing wheel parts. This method is attractive because of its ability to produce excellent seam welds at the rate of up to 120 in. per minute.

Closed Circuit

Each new transfer machine installation exhibits something novel. One of the most interesting we have seen recently is the Buhr transfer machine for the transmission case of the Power-Matic transmission being built by Allison for Chevrolet. About midway down the transfer line the case is turned 90-deg to a vertical position. It is so important to be sure the turnover is properly executed that Buhr has built in a closed circuit TV system with a scanning camera aimed at the turn-over fixture. The TV screen is mounted directly on the large control panel at the operator's loading station.

Tool Manual

Faced with the increasing problem of machining the hard-to-cut materials and alloys, Allison recently published a Tool Manual for internal use. It covers recommendations as to speeds and feeds, tool forms, grinding procedures, and cutting fluids. It marks an important management step in meeting the challenge of special materials.

Busy Readers

We learned recently that major executives of one large motor car company are so busy these days that they have but little time to read technical literature. They realize, however, that the reading of technical publications such as AUTOMOTIVE INDUSTRIES is a must if they are to keep in touch with developments in the industry. To meet this problem they have assigned a number of engineers as a reading committee. These men are required to read a large number of selected publications, select articles and news items of specific interest to each executive, and route the magazines to them. In each instance, the reader also appends a brief summary for the benefit of the busy executive. In effect, this procedure tends to cover more publications than any individual could normally scan and makes sure that no important material is overlooked.

Solar Energy

Stanford Research Institute News Bulletin January, 1956 reports that solar energy has come of age. A five-day meeting at the University of Arizona last fall disclosed working models and basic research reports on the subject. According to the SRI report it appears that practical uses of solar energy are not too far distant. Among the projects under discussion were: commercial possibilities of residential space heating and cooling and water heating; a solar furnace for high temperature industrial applications; a solar irrigation pump for Italy.

Fuel Injection

Perhaps as many as five or six parts makers are working seriously on the development of fuel injection for passenger cars. The experts say it is not a simple problem. Besides aiming for performance and economy competitive with modern four-barrel carburetors, there is the problem of high cost. Opinions vary as to cost. One major parts maker, who has been doing considerable development work, places it rather high. Another company believes they can build the unit for around $50. Wherever the cost will fall, it is felt that at the start only the higher priced cars will want to feature fuel injection.

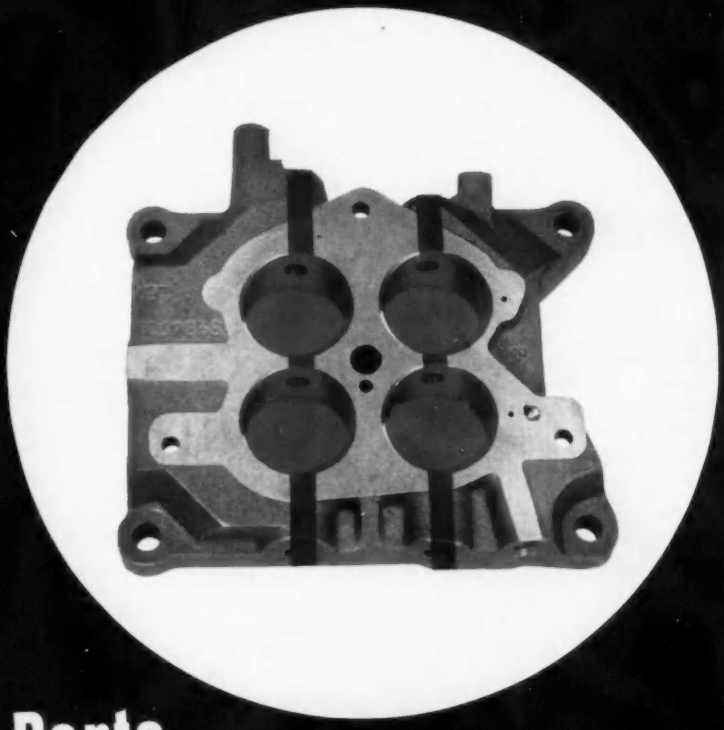
Plastic Connectors

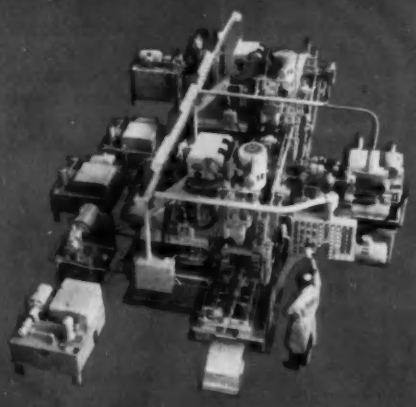
Inconspicuous but mighty effective and economical is an ingenious type of connector for wiring harness, using plastic bodies for both male and female terminals. These blade type connectors can be made with any number of connections and in any form required for a specific application. The most recent development of this idea will come to fruition on 1957 cars.

Emergency Power

We have mentioned on occasion the vital importance of stand-by engine driven electric generator packages in industry, hospitals and institutions and for civilian defense. Many of these power plants have been endowed with fully automatic operating cycles through the use of Synchro-Start control devices. An article in Steel Horizons, 4th Quarter, 1955 reminds us that a catastrophe such as hurricane Carol that swept Long Island mid-year was mitigated to some extent only by the availability of stand-by power in hospitals, radio stations, schools, and utility and telephone companies. Besides the larger power packages, small units suitable for private homes also are available.

Here's Automatic Production On High-precision Parts





Multiple-spindle drilling, boring, facing and tapping machines
Special machines for automatic production

When is fast transfer production limited by precision requirements? This frontier is steadily being pushed back by Natco engineers in new Holeway processing machines.

Take this throttle body, for example. The large holes are reamed to *limits of .0015" for location, .0003" for size, 125 microinch* finish! Production — *600 parts per hour!*

Natco's high-speed gun-drilling heads give required finish in interrupted throttle-shaft holes without reaming. Size is held to within .001".

Many unusual problems are solved in locating, holding and positively controlling light-weight parts between stations at high transfer speed. Chip disposal is automatic; cutting oil is filtered for re-use.

Here's the sequence of operations. Combination rough and semi-finish ream four large holes. Gun drill two holes (two breakthroughs each). Finish ream four large holes.

Whenever fast, automatic production makes sense, don't let high-precision requirements stop you. A Natco engineer can tell you in a hurry whether it's feasible and how the job can be done.

NATCO

National Automatic Tool Company, Inc. *Richmond, Indiana*

One Government procurement program that will not be cut back this year is the guided missile program. All three military services are being encouraged to push development of missiles with all available money and manpower.

Employment picture in 1956 will be bright, according to Labor Dept. figures. Total numbers of persons at work this year should continue to edge up past the 65 million mark.

Atomic Energy Commission is now testing a stationary forerunner of an atomic energy engine for aircraft. Construction will begin this spring on a test power plant large enough for huge aircraft carriers.

Important changes in the policies governing military real estate and surplus property disposal are in the making at Defense Dept. Pentagon may soon request Congress for authority to replace high-priced real estate with holdings that are adequate but less expensive.

Business is facing tough new regulations to control corporate mergers. They include a requirement that all but the smallest combinations give the Government 90 days' advance notice.

Detailed abstracts of more than 900 Government-owned patents which private industry may use royalty-free are contained in new Commerce Dept. publication. The 134-page supplement is sold at $3.75 by Office of Technical Services, U. S. Commerce Dept., Washington 25, D. C.

Russia may fire a ballistic missile with a 1500-mile range by the end of this year.

AUTOMATION News Report

(*Continued from page* 49)

with regard to automatable operations are metal forming and production welding. Even these, however, show a potential of around 10 per cent of total operations with a 50-50 split as regards replacing processes completely or modifying the existing equipment to achieve the objective.

HUGE DATA PROCESSING MACHINE

Chrysler's Parts Division plant, Centerline, Mich., has an electronic data processing machine that is able to control a daily nationwide inventory of more than 85,000 automotive parts and accessories at eight warehouses across the country. By ordinary bookkeeping methods it normally took the company a week to find out what was happening to these same parts.

Users of Chrysler Corp. products will be served by the brain when they place their orders for automotive equipment at their dealerships. It is devoted to the task of making certain that the right part is in the right place at the right time—ready for delivery when the customer needs it.

The machine, weighing 28 tons, is officially called the IBM 702 electronic data processing machine. It is able to make more than a quarter of a million inventory control decisions a day.

The brain can read 15,000 letters, numbers or symbols a second off magnetic tape that whirls through the machine at the rate of 75 ips.

It has a section that "thinks" and one that "remembers." The thinking section "asks" for information and instructions from the memory sections which remain unaltered during the process.

After computation the results can be printed at the rate of 150 lines per minute.

Inventory control is the first phase in using the machine. Eventually it will perform national billing to dealers, cost accounting and sales analysis.

EXPANSION PREDICTED

The president of a large manufacturer of automatic controls predicted that the current $3-billion-a-year industry of electronic instruments and automation equipment will be multiplied at least four times within the next 10 years.

William A. Ray, whose General Controls Co. will gross more than $27,000,000 during the fiscal year, pointed out that the entire automatic controls industry barely reached that figure 25 years ago.

"Automatic controls alone account for nearly $600,000,000 a year business today," he said, "and it is increasing at the rate of about 15 per cent a year. Within 10 years it will approximate today's radio and television sales."

General Controls Co. recently completed a survey of 900 firms in the automatic controls and instruments industry, found that 10 per cent of them are doing 80 per cent of the business, offering broader product lines through merger and acquisition.

There is a service station for every 298 automobiles, trucks, and buses in this country.

•

A fixed point on the crankshaft of a standard truck that has been driven 100,000 miles will have revolved about three billion times and will have traveled a distance equal to 16 times around the earth.

•

At road speeds of 60 mph, approximately 3000 gallons or 60 barrels of water are circulated through the average automobile radiator per hour.

•

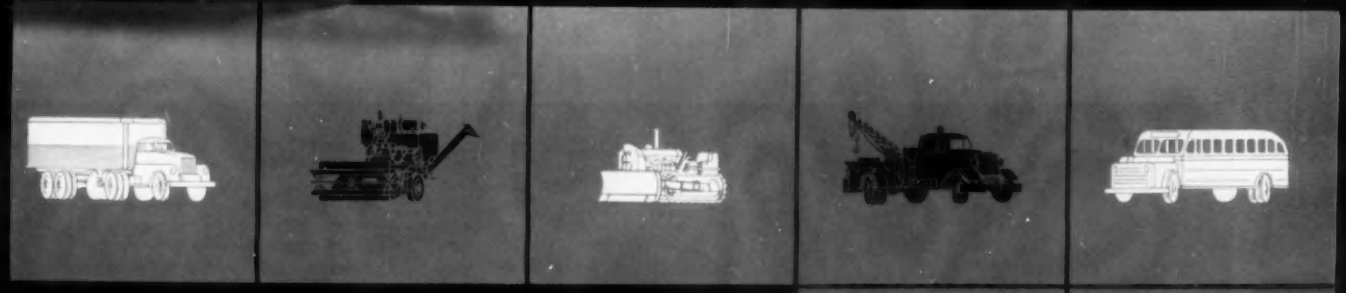
The refrigeration required to air condition an automobile for a 24-hr period on a hot summer day is equivalent to the cooling resulting from the melting of two tons of ice.

•

A jet engine weighs one-hundredth as much as a steam engine of equivalent horsepower.

•

A medium size turbojet engine used in a modern plane burns its own weight of petroleum fuel every 20 minutes.



Helping to put the POWER in Power Steering for Trucks, Buses, Tractors, Construction Equipment

When it comes to power steering, heavy duty over-the-road and off-the-road vehicles have special requirements. Components have to be huskier, tougher, able to stand up under the constant demands of heavy duty operation.

To provide unfaltering hydraulic power regardless of operating conditions, Borg-Warner's Pesco Products Division has developed a remarkable power steering pump. An engine-driven, positive-displacement gear pump specially designed for heavy duty equipment, it features Pesco's exclusive "Pressure Loaded" bearings which automatically adjust for wear . . . minimum power requirements . . . minimum size . . . weight of only 6.75 pounds . . . self-lubrication . . . built-in pressure relief valve with standard setting of 750 psi.

Like all Borg-Warner products, the Pesco power steering pump was born of B-W's "design it better—make it better" tradition. In this way Borg-Warner serves industry with both creative engineering and large-scale precision production.

B-W Engineering Makes It Work

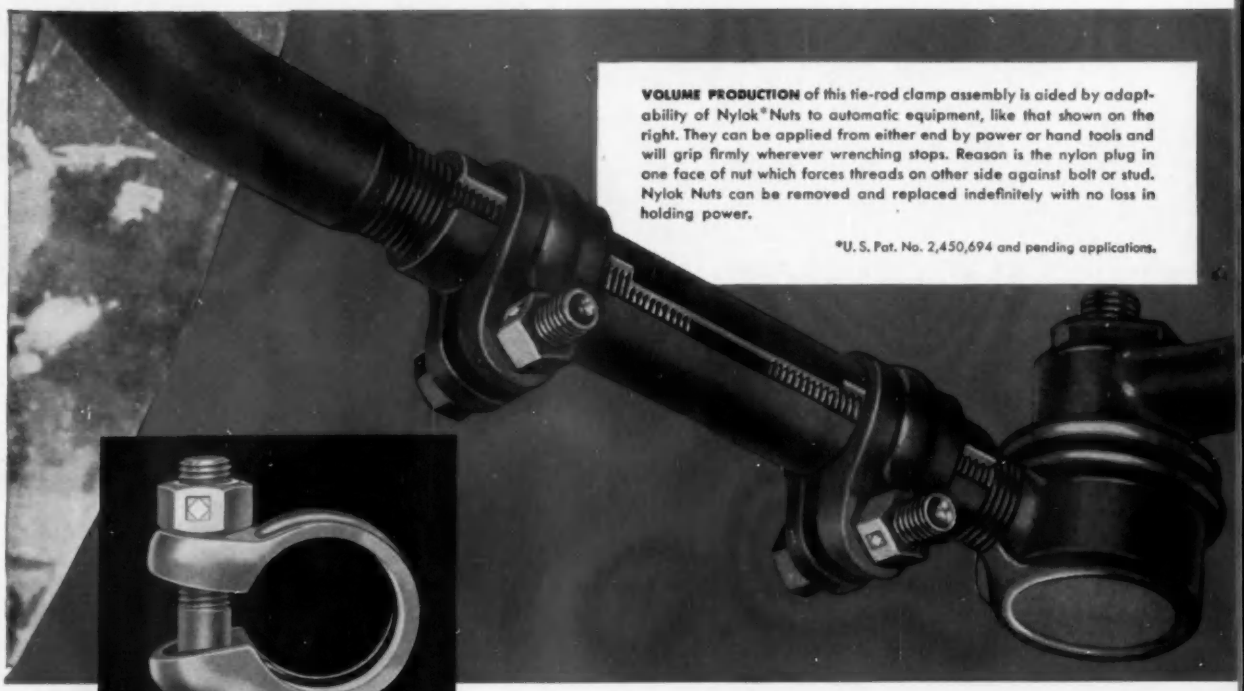
B-W Production Makes It Available

ENGINEERING B-W PRODUCTION

185 products in all are made by

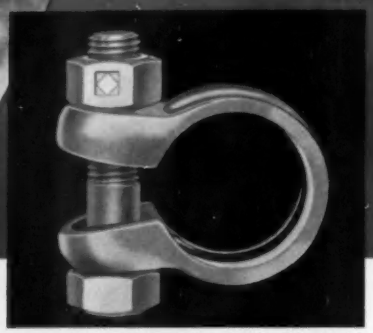
BORG-WARNER

THESE UNITS FORM BORG-WARNER, *Executive Offices, 310 S. Michigan Ave., Chicago.* **DIVISIONS:** ATKINS SAW • BORG & BECK • BYRON JACKSON CALUMET STEEL • DETROIT GEAR • FRANKLIN STEEL • HYDRALINE PRODUCTS • INGERSOLL CONDITIONED AIR • INGERSOLL KALAMAZOO • INGERSOLL PRODUCTS • INGERSOLL STEEL • LONG MANUFACTURING • MARBON CHEMICAL • MARVEL-SCHEBLER PRODUCTS • MECHANICS UNIVERSAL JOINT NORGE • PESCO PRODUCTS • ROCKFORD CLUTCH • SPRING DIVISION • WARNER AUTOMOTIVE PARTS • WARNER GEAR • WOOSTER DIVISION
SUBSIDIARIES: B-W ACCEPTANCE CORP • BORG-WARNER INTERNATIONAL • BORG-WARNER, LTD • BORG-WARNER SERVICE PARTS • LONG MFG., LTD MORSE CHAIN • MORSE CHAIN OF CANADA, LTD • REFLECTAL CORP • WARNER GEAR, LTD • WESTON HYDRAULICS, LTD



VOLUME PRODUCTION of this tie-rod clamp assembly is aided by adaptability of Nylok* Nuts to automatic equipment, like that shown on the right. They can be applied from either end by power or hand tools and will grip firmly wherever wrenching stops. Reason is the nylon plug in one face of nut which forces threads on other side against bolt or stud. Nylok Nuts can be removed and replaced indefinitely with no loss in holding power.

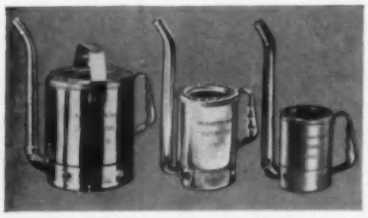
*U. S. Pat. No. 2,450,694 and pending applications.



POWERFUL CLAMP ACTION, maintained by Nylok Nuts, keeps vital steering tie-rod assembly securely in adjustment. Republic Nylok Nuts are currently in use on thousands of critical applications subject to shock, vibration and cyclic loading. Clip and mail the coupon for details.

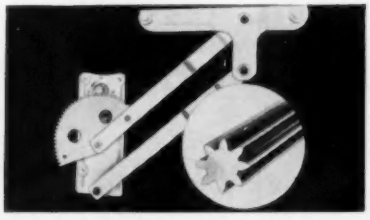
NYLOK NUTS

provide positive



FAST PRODUCTION of quality spouts for these oil dispensers is secured by using Republic ELECTRUNITE® Mechanical Tubing. The manufacturer, Swingspout Measure Company, Los Angeles, California, finds ELECTRUNITE easy to swedge and bend as required. Because Republic controls quality from ore to finished tubing, uniform strength, cross-section and ductility are assured. These characteristics underwrite quality in products fabricated from ELECTRUNITE. Send coupon for literature.

ELECTRO PAINTLOK® DOUBLES PRODUCTION of this water cooler manufacturer's painting and drying facilities. How? Because for this particular job Republic Electro Paintlok requires only one pass through paint shop and drying oven instead of two trips needed for uncoated sheets. Also, Electro Paintlok produces a superior finish. Its chemically treated coating actually grips paint . . . and even when scratched, limits corrosion to point of damage. Mail coupon for data.

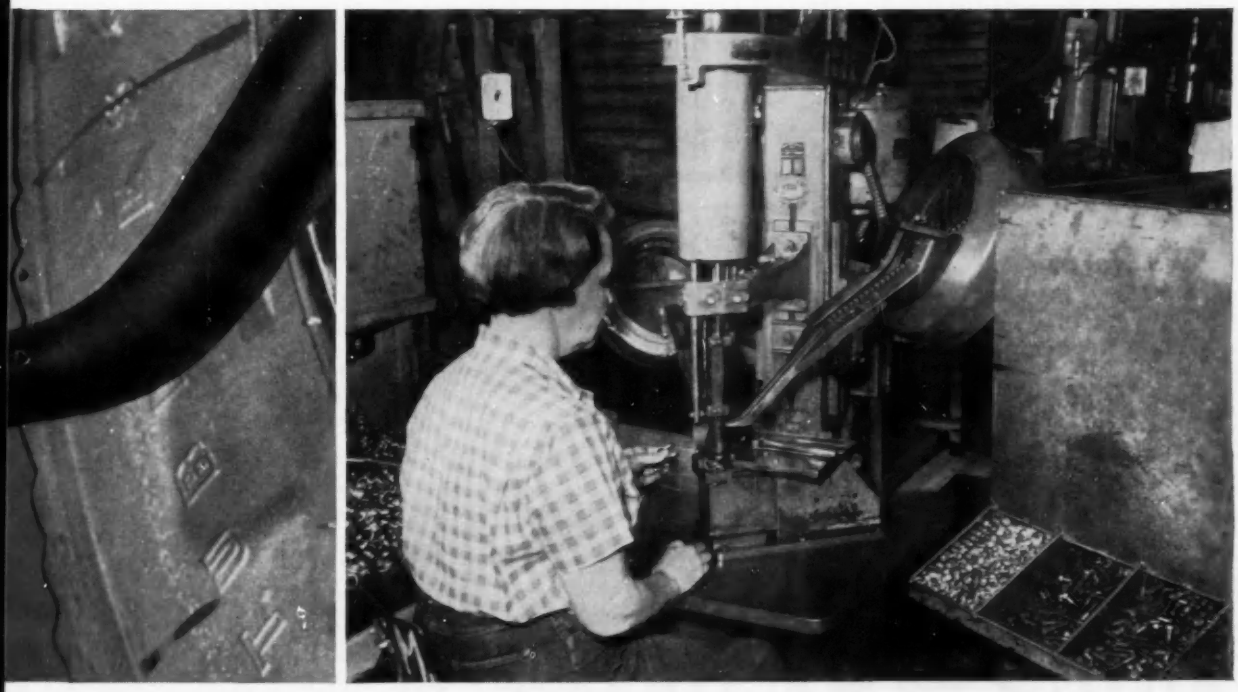


ECONOMICAL, VOLUME PRODUCTION of many parts starts with Republic Cold Drawn Special Sections. For example, the gear shown on this automobile window lift assembly is simply cut from a special section and drilled. In other cases, machining is minimized or eliminated entirely, thanks to fine surface and close tolerance produced by cold drawing. Design to take advantage of special sections and save. For facts, send coupon.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels



SPEED PRODUCTION...

locking and easy adjustment

In line with current emphasis on safety equipment in the automotive industry, engineers are studying every detail to assure maximum operating security. That's one of the reasons why Thompson Products, Inc., Michigan Division, has switched to Nylok Nuts for their steering tie-rod clamp assembly . . . produced for several top automobile manufacturers.

Actually, Thompson has found Nylok Nuts ideal for this application from several standpoints. For instance, they speed production by eliminating handling and assembly of lock washers . . . and since either end is up, Nylok Nuts are ideal for automatic feeding and power wrenching. In addition, they lock tightly even when not seated. Pre-assembled clamps can be freely handled with no possibility of losing the nut or bolt.

Finally, Nylok Nuts retain their grip after any number of tie-rod adjustments. They can be easily backed off with hand tools, and after the adjustment is made, wrenched tight again to stay.

Republic Nylok Nuts have been used in countless applications to speed assembly and provide maximum holding power under all conditions. Why not check your product to see where they will work to advantage for you? For complete information, contact your local Republic Bolt and Chain Division representative, or mail the coupon.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
Dept. C-1309
3106 East 45th Street
Cleveland 27, Ohio

Please send me further data on:

- ☐ Nylok Nuts
- ☐ Electro Paintlok
- ☐ ELECTRUNITE Mechanical Tubing
- ☐ Cold Finished Special Sections

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

New Uses for Plastics

(*Continued from page* 53)

material cost. This explains why massive tools such as stretch forms are exclusively made of plastic. If the cost of the plastic could be reduced and the material made reclaimable, tooling plastics could look to an even rosier future than is now in view.

At Republic Aviation Corp. we have been formulating and mixing our own resins for several years. This has saved us over $40,000 during 1955 alone on a 100,000 lb tooling resin consumption.

RP for Transportation

By Semond Levitt

Mechtronics Co.

Over 10,000,000 lb of reinforced plastics were used in 1955 for vehicles. In 1954 we could only point to companies developing uses for reinforced plastics in transportation equipment. This year many important parts in this large industry have gained wide acceptance and may become standards.

The big event during '55 was the use of premix molding for the Chrysler car heater. Not so big but just as important are the Lamicor reefers put out by Strick Co.; Fruehauf Trailer Co. using 25,000 lb of RP per month; United Parcel truck bodies by Lunn; and the number of companies producing or looking into small van and refrigerated truck bodies.

It appears that the 1954 prediction before the SPI that RP would become a standard material in the transportation industry has been substantiated in 1955.

Current Status of Reinforced Plastics in Transportation

By George K. Hammond

Owens-Corning Fiberglas Corp.

We can classify the present uses of reinforced plastics for transportation into three groups: (1) those where tooling cost savings lower piece costs below other materials, (2) those that provide superior performance at roughly the same cost including corollary or use savings and, (3) those that could not exist in any other material.

In the automotive industry the prime motivation appears to be initial economics. For this reason, most of the applications fall in the first classification.

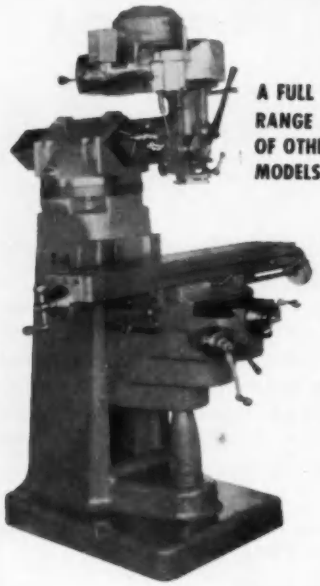
Important applications in the "best economics" area include the Corvette body for 1954-55 and the new 1956 model recently introduced in New York, the hardtop for the Thunderbird, removable hardtop, advanced one or few of a kind styling models, parts for a cab-over-engine truck, and an instrument panel used on the recently announced Studebaker sports coupe.

There are some parts which fall in the superior performance category. The most important examples are the heater housings and heater ducting parts developed initially for Chrysler. In these sisal and glass reinforcements are being added to provide desired properties. Two other applications meriting special note are Ford and Mercury station wagon trim rails that look like wood, and a highly styled pickup truck offered by General Motors. This truck employs reinforced plastics for rear fender, tail gate and tire carrier components.

LIKE A "45" AUTOMATIC

this NEW "45" INDEX MILL

has the "CALIBER" and "ACCURACY" to do your MILLING, DRILLING and BORING JOBS .. BETTER, FASTER AND MORE ECONOMICALLY!



A FULL RANGE OF OTHER MODELS.

The big caliber derives from the sliding overarm—The unique square design of this overarm gives much more rigidity with its resultant greater accuracy—It provides extra range and capacity—More usable working space—More versatility in set-up—More power at the cutter. No adjustment required on overarm and head after use, and no need to re-indicate head after moving overarm. Speed range with 9 changes makes possible the use of high speed or carbide tipped cutters to the best advantage. Many other important features. *Write for Literature.*

VISIT OUR BOOTH 791
A. S. T. E. Ind. Exp.

INDEX MACHINE CO.

551 N. MECHANIC STREET JACKSON, MICHIGAN

XIV

This is the fourteenth of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Silicon - What It Is and What It Does in Alloy Steels

Silicon is a very abundant nonmetallic element, one of the chief elementary constituents of the earth's crust. In the form of ferrosilicon, it is used by steelmakers as a deoxidizer and hardener in both alloy and carbon steels.

When the maximum silicon content is specified within the limits of 0.60 to 2.20 pct, the resulting steel is classed as a silicon alloy steel. However, all other standard alloy grades are specified to a range of 0.20 to 0.35 silicon for purposes of deoxidation. Silicon has several interesting effects, among them three that should be noted carefully: (1) it raises the critical temperature for heat-treatment; (2) as the amount is increased, it increases the susceptibility of steel to decarburization and graphitization; (3) combined with other alloying elements such as nickel, chromium, and tungsten, it promotes resistance to high temperature oxidation.

Silicon-Manganese Steels

Of the alloy steels relying heavily on silicon, one of the most important groups is the silicon-manganese series. As mentioned above, silicon is recognized as a deoxidizing agent, and a powerful one. Manganese behaves in the same manner but to a lesser degree.

Manganese exerts beneficial effects on the mechanical properties of heat-treated steel. Silicon as an alloy increases the strength. A properly balanced combination of the two elements produces a steel with unusually high strength, and with good ductility and shock-resistance.

Silicon-manganese steel has been widely used for the making of coil and leaf-type springs. It has also been used successfully for chisels, drift pins, punches, shear blades, mine bits, and other products that must be shock-resistant. It responds readily to oil-quenching, and when tempered at the correct temperature, it possesses not only shock-resistance but toughness and strength.

We invite you to consult with Bethlehem metallurgists whenever you wish to know more about silicon and its uses in steel. If you care to have them do so, these technicians will gladly suggest the proper analysis for your particular needs. Whatever it is, Bethlehem can furnish it, for Bethlehem makes all AISI standard alloy steels, as well as special-analysis steels and the full range of carbon grades.

If you would like to have a reprint of this advertisement, or of the entire series from I through XIV, please write to us, addressing your request to Publications Dept., Bethlehem Steel Company, Bethlehem, Pa.

BETHLEHEM STEEL COMPANY
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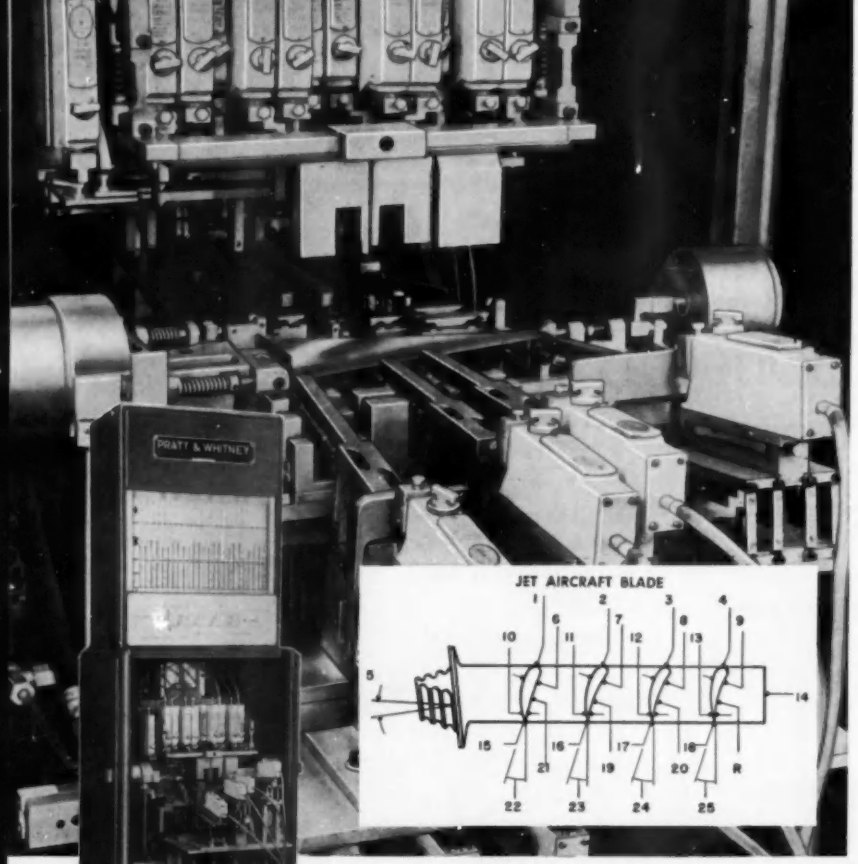
BETHLEHEM STEEL



GAGE
many dimensions...
rapidly, accurately

PRATT & WHITNEY
SIGMATIC
GAGING MACHINES

25 CRITICAL DIMENSIONS of jet engine compressor blades are checked simultaneously on this P&W, Semi-Automatic Type, SIGMATIC Gaging Machine. Gaging is fast (up to 350 blades per hour), low in cost and dependably accurate. By contrast, separate gaging of each dimension would be slow, prohibitively expensive, and subject to the element of human error.

Like all SIGMATIC Gages, this machine is versatile . . . able to check several different blade sizes by means of interchangeable gage tooling; changeover takes only about 30 minutes.

For large or small production runs . . . for in-process gaging or final inspection . . . *wherever* many dimensions of complex parts must be closely controlled, P&W SIGMATIC Gaging provides the practical, low cost answer. Use the coupon on the facing page to send for complete information; there's a machine *right* for your needs.

PRATT & WHITNEY COMPANY
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18 Charter Oak Boulevard, West Hartford 1, Connecticut
Direct Factory Representatives in Principal Cities

MACHINE TOOLS • GAGES • CUTTING TOOLS

Chevrolet Trucks

(*Continued from page* 32)

are designated at 19,000 and 22,000 lb maximum GVW, respectively. Previous high school-bus capacity for Chevrolet was 54 pupils.

With the new 322-cu in. V8, Chevrolet's truck power plants this year total 10—five V8's and five "6's." Stroke of the 195 hp engine is 3.2 in. and bore 4 in. with a 7.7-to-1 compression ratio. Other Loadmaster features are full pressure engine oil system and positive crankcase ventilation.

Trucks equipped with optional Chevrolet tandem equipment have the Loadmaster V8 engine with 13-in. coil spring clutch, heavy-duty five-speed transmission, combination three-speed auxiliary and power divider, two 15,000 lb axles, and walking beam suspension with enclosed two-stage "pile" springs.

Chevrolet's version of the power divider is operated from the cab by a selector lever. The divider allows dual-drive with positive 50-50 power division or single-axle drive, according to the driver's choice. The divider is contained in the same gearbox with a three-speed auxiliary transmission.

Because of its "rocking chair" action, walking beam suspension provides tandem axles with full operating flexibility for maximum traction in rough off-highway work. The design also permits automatic tracking or guiding of wheels around highway curves, over straightaways or other contours.

The optional tandems are available on three different wheelbases. Single-speed axles have a standard 6.17-to-1 or optional 7.2-to-1 ratio. A new power steering cylinder with longer stroke is optional for heavier-duty trucks.

In two groups of the 21 new models, front and rear brakes have been increased in size. An option is the air-over-hydraulic brake for 2- and 2½-ton units. This assembly includes an engine-mounted compressor and reservoir tank with an air pressure gage and low pressure alarm buzzer in the cab. Vacuum-powered 9½-in. Hydrovac brakes are standard on all heavy-duty models.

Other features of the heavy-duty models, as well as the remainder of the 1956 truck line, are tubeless tires and an improved 12-volt electrical system standard on all models. The automatic transmission is optional for all models except the school bus chassis.

Design of the

comes effective. Closed-throttle down-

For easy cleaning... genuine Leather

Genuine leather upholstery gives you a lot of sales features.
One of the best is its easy cleanability. Oil and grease,
food and beverage stains, mud and grime—they all swish right off
with a damp cloth and mild soap. No special treatment, no waxing or polishing
no dry-cleaning. Just an occasional washing to get rid of surface grime. No
wonder leather upholstery sews up the sale so often!

Only genuine leather wears as well as it looks

THE UPHOLSTERY LEATHER GROUP, INC. • **99 West Bethune, Detroit 2, Mich.** • 141 East 44th Street, New York 17, N.Y.

Ask about Amp's Creative Approach

Design of the Three-Speed Torque-Flite Transmission

(*Continued from page 33*)

overrunning clutch assembly mounted on the low-reverse band drum. Finally there is the compound low-reverse planetary gear set, and the kickdown planet pinion carrier assembly.

The front oil pump is located directly between the torque converter and gear box; the rear pump is located at the extension. The governor assembly may be seen mounted directly on the output shaft.

Special attention was given to smooth shifting characteristics. In drive position the shift from low to second gear is made exceptionally smooth by the action of the overrunning clutch which releases automatically at the moment second gear becomes effective. Closed-throttle downshifts when coming to a stop are from direct to low gear at about eight mph. Since the overrunning clutch does not transmit torque from the propeller shaft to the torque converter there is no annoying lurch or shock.

Normal upshifts in drive range from low to second gear occur at 10 mph with closed throttle, 26 mph at slightly less than full throttle, and at 40 mph at full throttle. Corresponding speeds for the shift from second to direct gear are; 15 mph, 58 mph, and 75 mph in drive range. Thus, automatic shifts occur at relatively low speeds under low throttle pressure, resulting in maximum fuel economy.

The new drive also provides an intermediate range "2" which is similar to drive range. This range can be selected at any speed below 70 mph. However, if the "2" button is pressed at speeds above 70 mph, the transmission will not downshift until car speed falls below 70 mph.

Due to higher starting rear wheel torque, a car equipped with the three-speed drive has ⅓ more grade climbing ability than with the former drive.

When descending a grade in low range with throttle closed, the new drive forces the engine to turn faster, producing an retarding force about ¼ greater, thus reducing or eliminating supplementary braking.

The new transmission is quieter in neutral than the former drive since there are no rotating elements in this phase.

The "1" position is effective only at speeds below 25 mph regardless of the speed of the car when the button is pushed. Once speed has dropped below 25 mph the transmission will shift to low and remain there until the range is changed. Reverse can be selected only below 10 mph; depressing the "R" button above 10 mph causes the transmission to shift into neutral to prevent damage.

Comparison of major elements with the two-speed PowerFlite shows that the three-speed drive has two multiple-disk clutches (instead of one), plus the addition of the overrunning clutch. To take care of added functions in the new drive, there is a total of 19 hydraulic valves as compared with 10 in the former version. The oil cooler is mounted at the front end of the engine, bolted directly to the water pump flange.

Weight has increased from 194.5 lb to 223.5 lb for the three-speed drive, an increase of 29 lb.

Specialized Production of
HARDENED & GROUND PARTS

When you've served the automotive industry for more than 40 years as we have done, you become quite adept at machining difficult pieces like the Beam Ball shown here.

Ball O.D. is ground to 3.375" ± .001; Bore, to 1.375" ± .001. Circular contour is absolutely concentric with bore centerline. Scientifically controlled heat treating provides exceptional surface hardness and consistent strength throughout. The specified finish is Parker-Lubrizing, as used on many of our products.

This is a sample of the metallurgical engineering, precision grinding and uniform quality that can be readily applied to mass production of your turned, hardened and ground parts. Let us quote on your requirements. Write or wire today.

Experienced production on:
King Pins
Shackle Bolts
Shackle Pins
Brake Anchor Bolts
Countershafts
Idler Shafts
Stub Axle Shafts
Steering Ball Bolts
Beam Balls and Bolts
5th Wheel Rocker Shafts
Wheel Studs
Water Pump Shafts
. . anything in the hardened and ground line, of any analysis steel, up to 4¼"

Henry W. Brown
PRESIDENT

THE BROWN CORP.

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Ask about amp's Creative Approach
TO BETTER WIRING

for every automotive application

A-MP terminals

Wherever there's a wire in a car there's an A-MP Terminal to connect it.

- Top electrical and mechanical performance.
- Accepted by leading auto and truck manufacturers.
- Patented pressure-crimp eliminates all soldering and welding.
- A-MP Automachines crimp up to 4000 perfect, uniform terminations per hour with unskilled labor.
- A-MP Sales Engineers' electrical terminal knowledge in the auto industry will be valuable in solving your most difficult wiring problems.

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New Concept of Auto Clock Perfection

DEVELOPED BY RENOWNED

LUX TIMER LABORATORIES

Keeps Time Accurately — all the Time

Here at last, an automobile clock that duplicates perfection of choicest timepieces. Keeps telling time accurately . . . without setting any "Fast-Slow" regulator.

Regulates Automatically

Just set the clock . . . it regulates itself automatically. Engineered friction arrangement on setting shaft accomplishes self-regulating compensation.

Exclusive Mechanical Break

Sensational mechanical break on contact mechanism eliminates freezing of contacts . . . increases contact life-expectancy to 30 years by laboratory tests.

Dials, mountings etc. are custom styled for individuality . . . wide size range meets specifications of all automobile manufacturers.

Write for Specifications and Complete Performance Data.

DEPARTMENT A

THE LUX CLOCK MFG. CO., INC.

WATERBURY 20, CONNECTICUT

Automatic Balancing of Wheels and Tires

(*Continued from page* 52)

The loading station consists of a power-driven roller conveyor, receiving the assemblies from the feeder conveyor and transferring them to the balance stations.

As the assemblies proceed from the loading station they are transferred in pairs to the two balance stations, at which time the conveyor section lowers to permit the assemblies to rest on their respective air-ball pivot adapters. Compressed air lifts the adapter and wheel assembly and floats it on the film of air, providing a friction free mounting that permits the assembly to tilt freely due to unbalance.

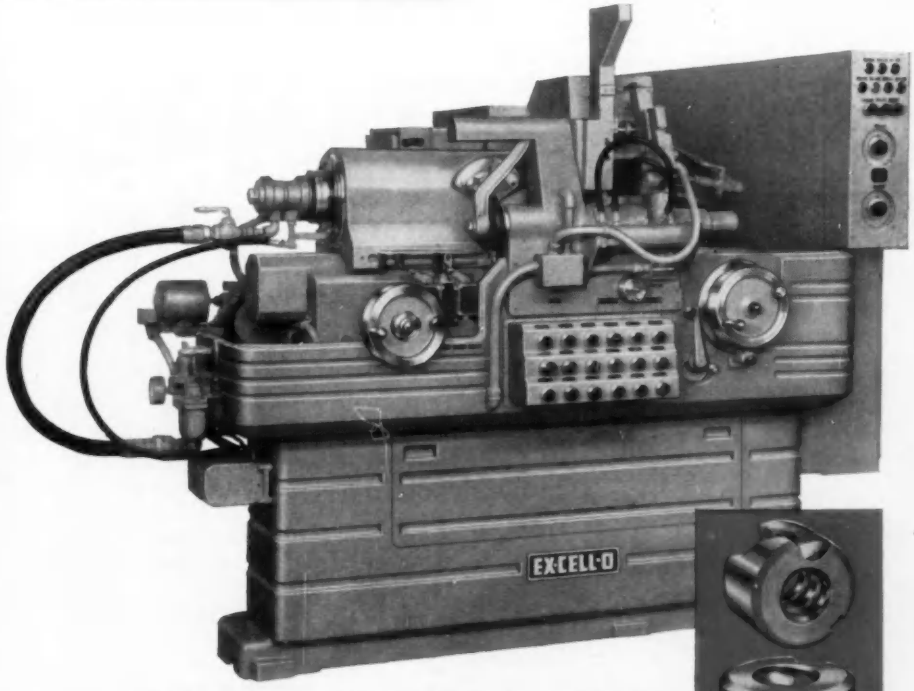
Maximum tilt angle is measured by two Schaevitz differential pick-up units connected to the adapter and spaced 90 deg apart. Output signals from the pick-up unit are electronically translated into amplitude and angle of unbalance. A servo-driven index unit, mounted centrally above the adapter, positions itself at the unbalance angle. At the same time the unbalance amount wheel indexes to the measured unbalance unit. Upon completion of this cycle—which is extremely rapid—the index head stops and the marker wheel comes into position to stamp the amount of unbalance in ounces at the indicated angle on the inside rim of the wheel.

At the completion of this cycle, the conveyor section at the balancing stations rises to remove the assemblies from the adapters, arriving at the level of the load and unload conveyor position. A subsequent transfer cycle shuttles the marked assemblies onto the unload station and reloads the balance stations.

The unload station is mounted on a slight downgrade to permit the outgoing assemblies to move by gravity to the unload conveyor. At this point two operators select the proper weight, as indicated by the code marking on the rim, and attach it to the wheel rim at the proper location.

On rare occasions, if an assembly is out of balance beyond the limit of machine correction, it is marked "X," identifying it as a reject and it is taken off the line.

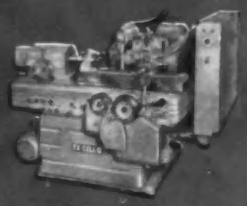
AUTOMOTIVE INDUSTRIES KEEPS YOU INFORMED



Ex-Cell-O Style 39-A Precision Internal Thread Grinder equipped with automatic work handling equipment. This machine loads, locates, grinds threads and ejects steering gear ball nuts in a completely automatic cycle.

EX-CELL-O Thread Grinders

Manual – Automatic – Automated



EX-CELL-O STYLE 33 FOR EXTERNAL THREADS: An accurate production machine, automatic except for loading, unloading, and moving the cycle lever. Can be arranged for tapered grinding and for eccentric relief grinding.

EX-CELL-O STYLE 36 FOR LONG EXTERNAL THREADS, also available with internal attachment. A high production machine with easily adjusted work cycles.

EX-CELL-O STYLE 50: A versatile machine for external work . . . also available with internal attachment.

EX-CELL-O STYLE 120: Our largest Thread Grinder. Grinds 10 feet of thread in one setting. Accommodates 12 feet of stock between centers.

These standard machines are grinding thread gages, machine tool lead screws, innumerable aircraft parts, automotive steering mechanisms and pinions, worms, taps, and many similar workpieces.

Precision thread grinders in this Ex-Cell-O line range from manually-operated models, for toolroom and for short runs, to high production automatics, to styles equipped with automatic work handling equipment. There are five models designed to meet your every requirement.

For specific information on thread grinder operations or a quotation on a machine for your requirements, call your local Ex-Cell-O representative or write Ex-Cell-O in Detroit.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

56-5

XLO

EX-CELL-O for PRECISION

MACHINERY NEWS

(*Continued from page* 68)

Army Says It's Prepared

When questioned about the new policy, F. H. Higgins, Assistant Secretary of the Army (Logistics), countered with the big "if." If it (the program) is supported by Congress and the services, yes, it will be a big improvement, according to the Secretary. He went on to say that the Army's program is based on having tools in hand or on trigger order to meet the needs of the war of the future. The Army, Higgins says, now has the capacity in each production area to meet its needs until new tools could be put into production. (Ed. Note — If, the next war lasts that long.)

What Happened to the Elephants

Swan E. Bergstrom, vice president and director, Cincinnati Milling Machine Co., past president of the National Machine Tool Builders' Association, and chairman of the NMTBA Committee on Permanent Defense Capacity, represented the Association at the hearings. Under questioning, Bergstrom stated that he did not understand why the elephant tool program failed to get more consideration, and that he would like to see a movement to push for its reinstatement. He also told the joint committees that the machine tool industry is going to work with ODM to develop standby price and priority controls for an emergency. In his statement read before the Senatorial group, he asked for assurances that machine buying will not be curtailed and for an industry exemption from any extension of the renegotiation act. The industry also wants draft deferments for its skilled workers. In his prepared report, he attacked the Buy America act which has permitted Air Force procurement of foreign tools.

. . . for best engine performance

Engineered for modern high-compression engine design to give accurate temperature control with pressurized cooling systems. Speeds warm-up—saves gasoline and oil—reduces engine wear. Gets more heat from the car heater.

Now original equipment on thirty-four (34) leading makes of cars, trucks, tractors, commercial vehicles, industrial and marine engines.

Literature sent on request—please use your letterhead.

Control with Dole 50th Anniversary 1906 1956

Control with Dole TRADE MARK

DOLE

THE DOLE VALVE COMPANY

1901 Carroll Ave., Chicago 12, Ill.

Detroit • Los Angeles • Philadelphia

METALS

(*Continued from page* 66)

copper supply will be much improved by midyear may halt this move.

Reflecting higher materials cost, brass fabricators have raised prices for many of their products. Inventories, considered reasonably satisfactory at the start of the year, are now causing concern.

Government Continues to Bid for Lead and Zinc

Somewhat to the surprise of the trade, General Services Administration rather belatedly asked for tenders of lead and zinc for the stockpile at current market prices, that is, at 29½ cents per lb for both metals. This was about 1½ cents more than what has been expected. In recent months only a relatively small tonnage has been offered to the Government, as industrial requirements for both metals has been heavy. It is estimated that about 60,000 tons of lead and 110,000 tons of zinc remain to be bought to attain the stockpile objectives. Nevertheless, as long as the Government remains willing to pay 29½ cents for the metals, this price acts as a floor support.

Lead demand has been good but not pressing. Buyers apparently took on considerable metal after the first of the year. The Australian dock strike was expected to tighten supply, but has had little effect on the market. Renewed pressure is being brought to increase the tariff on imports of lead

Black & Decker®

production tools mean low initial cost, low operating cost, more convenience, less noise-and they're

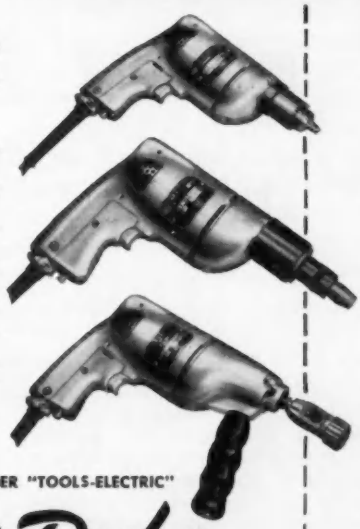
POWER-BUILT TO LAST!

We don't buy motors— we build them!

The *heart* of your electric tool is the motor—completely built by Black & Decker. All the power you need and then some — because each motor is built for a specific tool and the job it must do. B&D motors always *stand up!*

These B&D production triplets typify the power, speed and accuracy of all Black & Decker tools.

The B&D originated pistol-grip and trigger switch; the lightweight balanced power that reduces operator fatigue and increases production; the sturdy B&D built motor—all teaming up to give you high speed efficiency on the production line. Call your B&D distributor for free demonstration or write to: THE BLACK & DECKER MFG. CO., Dept. 1603, Towson 4, Md.



HOLGUN* Amazingly compact heavy-duty production drill. Especially good for "close-corner," continuous drilling. Up to ¼" in steel; ½" in hardwoods.

SCRUGUN* Drives machine or lag screws up to ¼" diameter. Positive or adjustable clutch.

TAPGUN* Drives ¼" taps for threading holes in steel, cast iron; ½" in brass or aluminum. Automatic reversing mechanism, no switch needed.

*T. M. Reg. U. S. Pat. Off.

SERVICE . . . one of 42 Black & Decker factory service branches is located "next door" to you. Staffed by experts to give fast, efficient service, genuine replacement parts.

LOOK IN THE YELLOW PAGES UNDER "TOOLS-ELECTRIC"

B&D Black & Decker®

PORTABLE ELECTRIC TOOLS

AUTOMOTIVE

INDUSTRIES

Goes into

Leading

Plants in the

Automotive

and Aircraft

Industries

and zinc, which would go automatically into effect should prices fall below a predetermined level.

Zinc Diecasters Hit By Automobile Cutback

Zinc statistics for January show little change. Production continues at a high rate with domestic shipments taking virtually the entire output. Stocks of metal at the end of January showed a negligible increase, but unfilled orders were down 12,200 tons from the figure reported at year end.

This is not surprising. The cutback in automobile production will cut seriously into demand for zinc diecastings, now challenging galvanizing as zinc's most important market, which accounted for close to 400,000 tons last year. The automobile industry was far the best customer of zinc diecasters for fittings and accessories such as grill work. Any cutback in motor output would be reflected in lower demand for Special High Grade metal, until now in relatively tight supply.

It might be suspected that diecasters will probably be quick to demand price concessions from the zinc producers if they scent over-supply. Last October they were successful in forcing a price reduction when the market was raised to 13½ cents per lb where it stayed for less than a week. The price returned to 13 cents until early in January when it was again advanced. This time it stuck, largely because of the strength in London, but the price abroad has recently been unsteady.

Larger Aluminum Capacity Planned

Aluminum made headline news last month. Demand continues extraordinarily stronger in all markets. While secondary aluminum prices declined slightly they still remain about five cents per lb more than primary. Executives of aluminum producers are exuberant over the outlook for their metal.

Plans for increased production run into high figures. The Ford Company contracted with Reynolds Metals for the largest industrial aluminum order ever placed, to buy 320,000 tons over the next 10 years. Reynolds will up its output from 414,000 tons to 560,000 tons with completion of its new plant at Listerhill and other facilities. Olin Mathieson plans to build a $120 million fully integrated aluminum plant, using coal mined directly on the site as a source of power, with a capacity of 60,000 tons a year. Alcoa is stepping up production in

small-unit packaging simplifies use and handling of

STAINLESS STEEL SAFETY LOCK WIRE

The availability of stainless steel safety lock wire on 1, 5 and 10-pound disposable spools is good news to manufacturers and service organizations in the aircraft, automotive and machinery industries—or wherever safety lock wire is required.

These small-unit spools—now offered for the first time by National-Standard—are expected to simplify many manufacturing and servicing operations, ranging from extensive use of the handy 1-pound hip pocket or toolbox spools in non-localized work, to bench or production uses for the larger spools.

In addition to spools of the 3 capacities, National-Standard offers the lock wire in a complete range of sizes, from 0.020 to 0.067-inch and in five different government specifications: QQ-W-423; AN-W-23; AN-W-24; MIL-W-6713 and AMS-5685-C.

Spools of all three sizes can be mounted on "let-off" spindles and are clearly labeled as to type and size of wire. The 1-pound spools are plastic, the larger spools metal.

NS NATIONAL-STANDARD Company NILES, MICHIGAN

NATIONAL-STANDARD COMPANY • NILES, MICHIGAN
Tire Wire, Stainless, Fabricated Braids and Tape
ATHENIA STEEL DIVISION • CLIFTON, N. J.
Flat, High Carbon, Cold Rolled Spring Steel
REYNOLDS WIRE DIVISION • DIXON, ILLINOIS
Industrial Wire Cloth
WAGNER LITHO MACHINERY DIVISION • JERSEY CITY, N. J.
Special Machinery for Metal Decorating
WORCESTER WIRE WORKS DIVISION • WORCESTER, MASS.
Round and Shaped Steel Wire, Small Sizes

THIS 1200 FT. PLANET CONVEYOR moves 20 tons of scrap per hour!

Planet apron conveyor moving through tunnel beneath trim presses.

At a leading automobile plant . . . this Planet conveyor automatically handles the loose scrap from trim presses with a combined capacity of over 4,000 tons.
Over 20 tons of scrap per hour drop on a Planet hinged-pan apron conveyor as it moves through a tunnel under the presses. Moving to an automatic baler, the scrap is compressed into 2' cubes. Then the baled scrap moves on a Planet pusher bar conveyor direct to the waiting railroad cars. A simple clutch-operated auxiliary drive assures continuity of operation.

Because baled scrap is worth more . . .
Because the entire operation is automatic . . .
Because this scrap-handling system saves time and labor . .

• It PAID this manufacturer to "Plan with Planet." It will pay you too! Better write today!

PLANET CORPORATION
1822 SUNSET AVENUE
LANSING, MICHIGAN

• CONVEYORS
• ENGINEERED SYSTEMS
• FOUNDRY EQUIPMENT
• AUTOMATION
• STEEL FABRICATION

Texas, to boost output 75,000 tons. Including new plants scheduled, total domestic capacity will be increased over 571,000 tons by 1957.

It is now asserted that 1956 automobiles will have an average of 35 pounds of aluminum per car, and that by 1960 the figure will run to 50 lb, and to 80 lb by 1965. Even higher figures are projected by some producers.

Aluminum may hold at the present price level until mid-summer but it is almost certain to sell higher after the wage negotiations in July, which are likely to follow the pattern in steel.

International Tin Agreement Signed

Although the International Tin Agreement was finally signed by Indonesia which makes it effective, the price of tin has weakened, selling down from $1.05 to 95 cents per lb in London. The Agreement paves the way for stabilized tin prices with a range of 80 cents to $1.10 per lb, with a buffer agency to be set up with authority to sell at the higher price and buy at the lower with money and tin to be supplied by member nations, in an attempt to alleviate temporary shortages and to prevent violent price swings.

New Designs from Czechoslovakia

(*Continued from page* 48)

since its position is unaffected by the small pull of the return spring on the brake shoe.

With lining wear, however, forward piston travel increases and the inside face of the groove bears against the ring. The hydraulic pressure is sufficient to push the ring outwards along the cylinder, relocating it sufficiently to compensate for lining wear. Thus a constant piston and shoe movement is maintained, and braking action on all wheels is automatically equalized. Both single- and double-acting expanders are made, and 2000 of these units are now installed in vehicles for test purposes.

Czechoslovakia is exporting the bulk of its vehicle production, and efforts to promote sales to the West have recently been intensified. At the same time, the growing demand for cars on the home market continues largely unsatisfied. In order to meet this need, another small manufacturer has developed an unusual low-cost

Don't Waste Hours ADJUSTING AND SETTING CONVENTIONAL DIES

when the "WALES-WAY" takes ONLY MINUTES!

A WALES TOOL

TAKES MINUTES TO SET

AND ELIMINATES HOURS OF

- set-up time
- press down time
- setting stripping guides
- counter-boring for springs
- setting heavy stripper plates
- die buttons, etc. etc.

WALES MOBILE TRUCK UNITS

We have a well-equipped Motor Truck . . . a shop on wheels . . . that will demonstrate "WALES-WAY" methods right at your door. We will gladly arrange to have you see and use this demonstration. Please let us know a suitable time.

A Typical Foreman says:

"That's the way it's been around this shop for years. Still would be if the boss hadn't heard about WALES Hole Punching UNITS. What a deal.

"Instead of building a new die for each pattern, setting it in, lining it up and constantly checking to make sure punch and guide register, instead of watching every down stroke of the press ram, watching the special punch plates, stripper plates, die buttons and all the rest of time cosuming detail . . .

". . . we do it the "WALES-WAY" *now*. We set up a group of these self contained, individual WALES UNITS, one group for each pattern. We do it *fast*; so fast that our first run is on the punch press the same day. We can set up in minutes, change in minutes, shove work through faster than ever before because of the automatic guide principle that keeps the run accurate to the hair line from first to last ram press stroke."

WALES UNITS may be used over and over again. No dead storage. No enormous files of dies, plates etc. to be combed over for a re-run. This wonderfully flexible method requires a minimum of equipment at a minimum of cost. Saves hours and hours in your shop. Makes plenty of additional profit on every run.

No die-set needed, no pressure pads, no stripper plates with WALES UNITS. Punches, stripping guides, springs and guide buttons are all component parts of the UNITS — not attached to the press ram. WALES UNITS have a shut height of 5½" so only one adjustment of the ram is needed.

WALES ENGINEERING SERVICE • Our Engineers will survey your shop, your work, your methods if you wish, entirely without obligation. You'll receive valuable information and suggestions for time saving and EXTRA PROFITS.

Send for

BULLETIN NO. 17A

This folder contains much information that should interest you. Pictures and data to help you judge the merits of "the WALES-WAY"

SEE OUR EXHIBIT BOOTH 379
CHICAGO MARCH 19-23

WALES Strippit CORPORATION
"...the Wales-Way is the PLUS-PROFIT way"
345 PAYNE AVE. — North Tonawanda, N.Y.
WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONT.

I'M A TOUGH BUYER

BUT GARRETT'S GOT IT FOR QUALITY

No sir, *you can't beat Garrett* when it comes to top quality in small parts. Their "statistical quality control system" means every shipment you get is the finest. But quality is only part of what I like about Garrett. They manufacture and stock the world's most complete line of washers and hose clamps. Boy, when you need any kind of a lock washer, flat washer, spring washer or hose clamp you get it fast . . . most everything right out of stock.

When it comes to stampings and assemblies that's where their high-speed automatic equipment stars. Turns out exactly what you want in no time at all.

Sure, I'm a tough buyer. I want the best. I want it fast. I want it priced right. And Garrett is the place for me.

LOCK WASHERS
FLAT WASHERS
HOSE CLAMPS
STAMPINGS

Manufactured by

GEORGE K. GARRETT CO., Inc.
Philadelphia 34, Pa.

Garrett
OF PHILADELPHIA

three-wheeler. Its body consists of canvas panels stretched over a tubular frame. It weighs only 600 lb, and is powered by a two-stroke engine at the rear.

The government is also seriously considering the import of foreign cars. It recently bought 1000 French Renaults for domestic resale. Originally, negotiations for this lot were conducted with British Austin, but the deal fell through because of complications in Anglo-Czech trade. It is understood that there may be further purchases from the West in the future.

Special Press Setup for Fender and Hood Production

(*Continued from page* 34)

gether with piercing of molding holes. Then the headlamp section is trimmed and flanged.

At this point the headlamp section is open, and requires the assembly and welding of a filler panel to provide for attachment of the headlamp. Following this, the headlamp section is finish-formed, restruck, and holes are pierced for the wheelhouse and headlamp.

The next step is to flange the sill and pierce front holes. Then flange the under rail and restrike rear end.

At this point the fenders enter another group of multiple sun spot welding machines for welding the lower reinforcement, and the front reinforcement.

Fenders return to the press line for piercing hood ledge holes and finish-trim and pierce of headlamps.

The rear and flange reinforcements then are assembled and welded to the fender. This is followed by bending the tab, finishing and polishing.

It may be gathered from the foregoing that front fenders are required to follow a long sequence of detail operations in a variety of presses and welders. It is noteworthy that despite the complicated course of events, the actual flow of operations is extremely smooth. Moreover, the die equipment has been tuned and fitted so well that most of the metal finishing operations ordinarily associated with fender stamping are no longer required. Except for touch-up at several points around the headlamp section, they are processed with little grinding or polishing.

Portable Nibbler Cuts 10 Ga. Stainless Steel

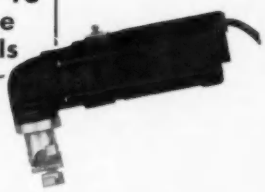
Above you see Fenway's new Heavy Duty Nibbler cutting through a piece of 10 ga. stainless steel. On milder steels or non-ferrous, it will handle 8 ga. with ease.

Cutting action is provided by a patented, tool-steel punch and die that bites out a ¼" slug of metal with each stroke, leaving a clean cut, without distortion on either side. Full load cutting speed is 24" a minute. Minimum cutting radius is 6".

Portable, versatile, maneuverable, the Fenway Nibbler is ideal for following templates or patterns. It also cuts corrugated stock or holes in tubes or ducts without distorting original contour.

If a tool like this could save money or solve a problem for you, then write today for more information on Fenway Model HN Heavy Duty Portable Nibbler.

14 and 18 gauge models



For working lighter sheet, Fenway offers Models MN and LN. Model MN is rated for 14 ga. stainless* and cuts at 36" a minute full load, with min. cutting radius of 1". Model LN, rated for 18 ga. stainless*, cuts 43" a minute; min. radius ¾". All Fenway Nibblers are unconditionally guaranteed.

*Softer metals in proportionately heavier gauges.

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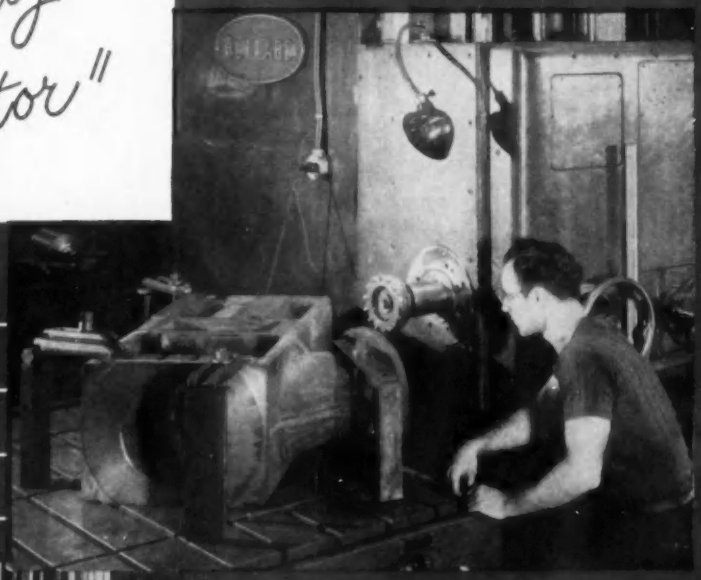
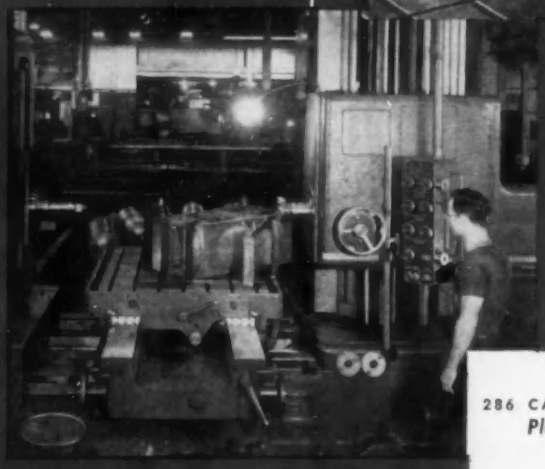


the machine is outstanding for ease of operation



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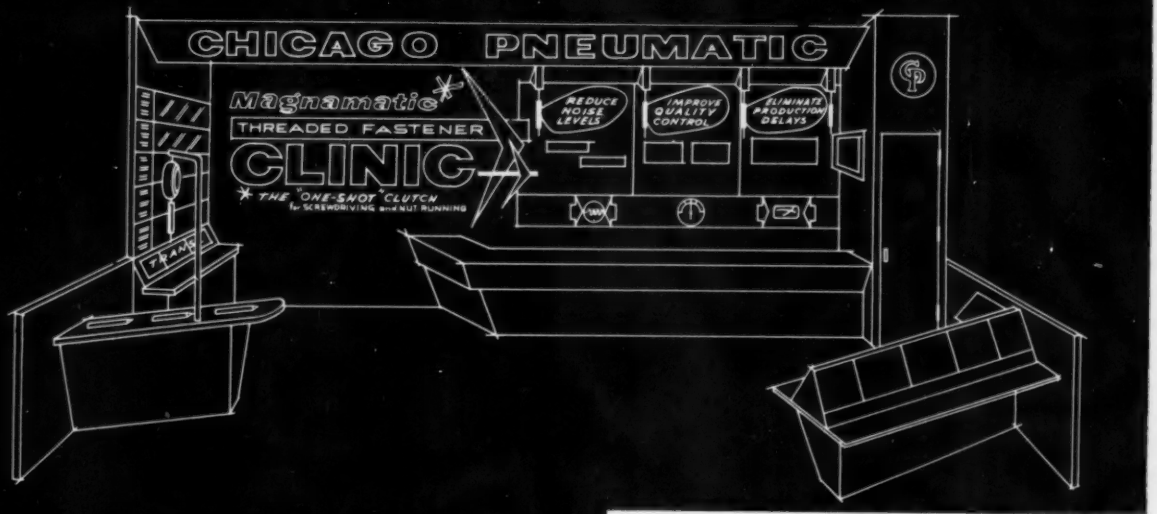

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BIG BROTHER BENDER

Model BBB

SMALLER MODELS AVAILABLE

Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender.

AIR OPERATED MODELS IN FOUR SIZES

The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches — punching and blanking dies extra. Will punch holes up to 1" and form material up to ¼" thick by 4" wide. We also build smaller models, hand or air operated, for bending materials up to ⅛" x 1½".

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Flexible Press Setup

(*Continued from page 39*)

reserve safety factor to avoid picking-up a piece part and creating an overload on the following stroke.

The sequence of operations is as follows: Blanks are loaded into the stack feed at station one. A push bar moves one blank at a time to station two where a switch tests for blank thickness. In case of a double blank the switch will automatically shut down the equipment. From this point, through the rest of the presses, the transfer feed fingers move the piece part from station to station. Station three is the cupping operation in the first press. This operation requires the full 275 tons of pressure. Stations four, five, six and seven are idle. Station eight is the reverse forming operation and takes place in the second press. This requires approximately 500 tons pressure. Station nine is idle. Station 10 is equipped with a flip-over device for future use. Stations 11 and 12 are idle. Station 13 is the edge cupping and piercing operation. Station 14 is idle. Station 15 the stamping is turned over and 16 and 17 are idle. Station 18 is the bore sizing and undercutting operation. This also requires 300 tons pressure. At station 19 the finished stamping is dropped into an unloading chute.

Fuller Transmission

(*Continued from page 50*)

in the clutching gears, increased shaft sizes in the front section, and changes in the number of teeth and pitch of gear teeth in the rear section. These changes account for the number of parts that are not interchangeable with the former models.

On the new models the air cylinder is mounted horizontally on the left side and now is stationary. The auxiliary countershaft is swung 45-deg to the right to provide space for nesting the air cylinder close to the case. Studs are provided in the rear in the same location as before to provide for mounting the Tru-Stop (ACC) brake.

An interesting feature of interchangeability between the R-96 and R-960 is that either one can be altered to make the other by changing only five basic parts.

Another new feature is flexibility of clutch operation. Fuller now makes available either push or pull type actuation at the customer's option.

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IMPACT HAMMER

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EASILY ADJUSTABLE to any pressure within capacity, impact is then constant at any point in the stroke. Variations in stock thickness or improper positioning are handled without damage to work, dies or hammer.

FOR THOSE AWKWARD JOBS, from forming to forging, the head of the Z-2 may be purchased separately and mounted at any angle, even upside down.

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OPERATES on 60-175 lbs. pressure when equipped for air but table is available for either air or hydraulic operation. 4, 6, 8, or 12 stations are standard but others, up to 30, are made to order.

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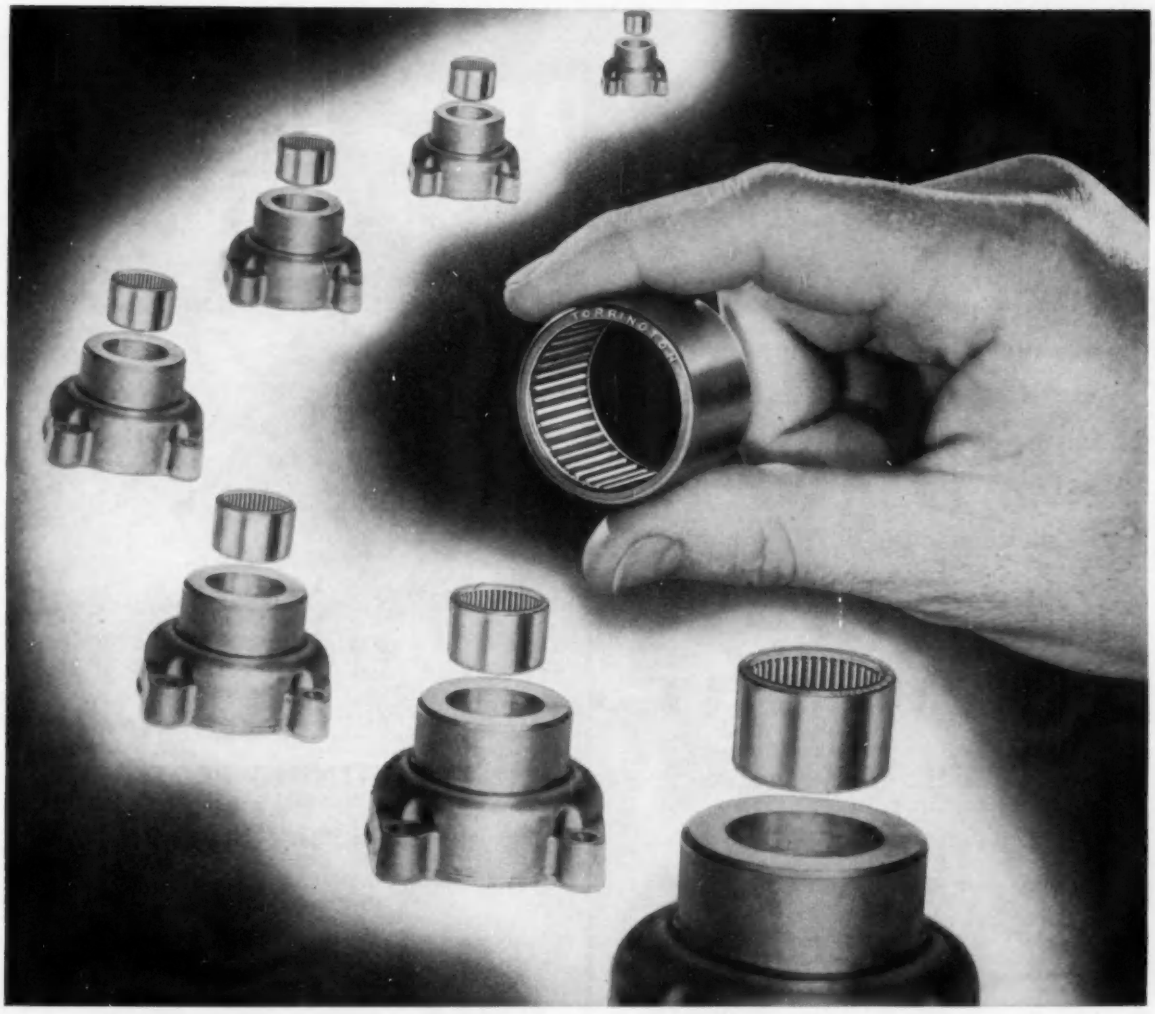

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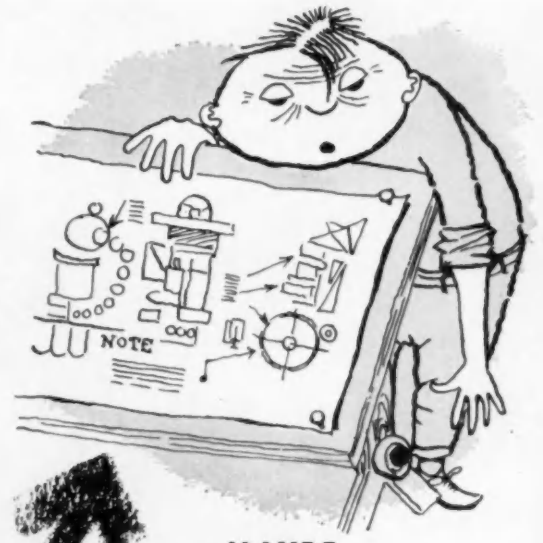

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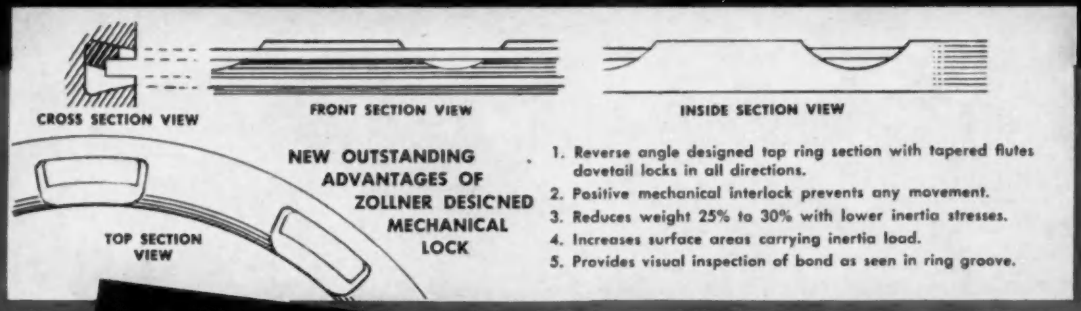
WITH "NI-RESIST" IRON TOP RING SECTION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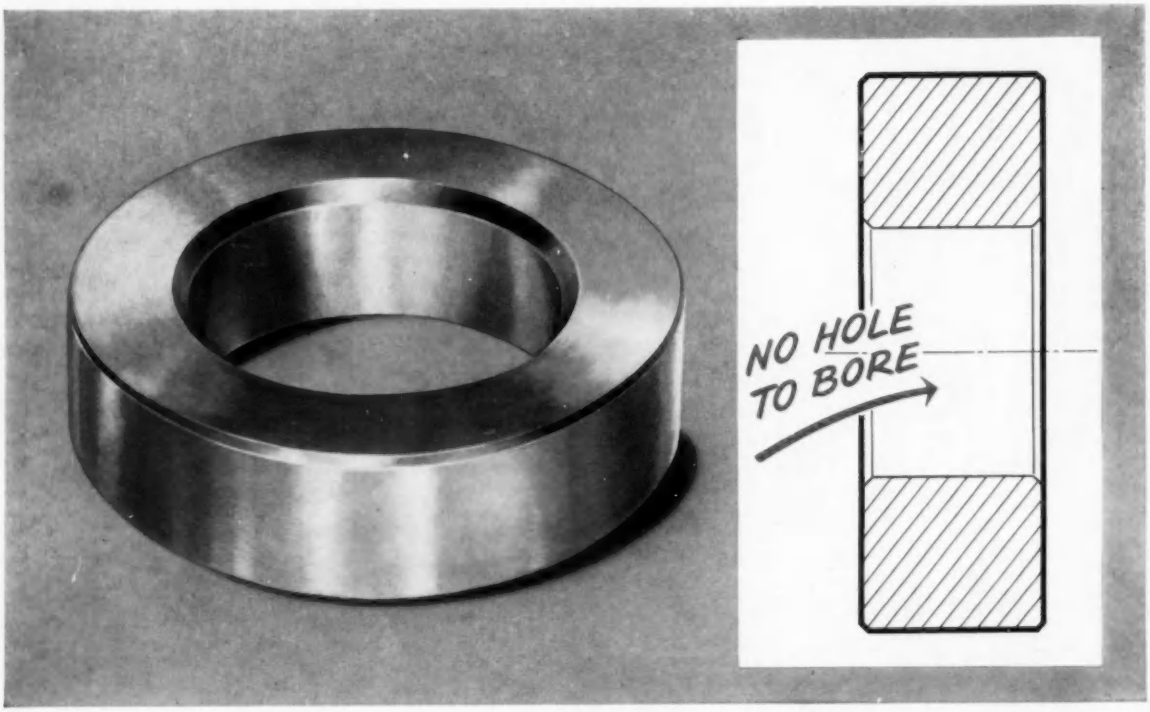

Steps up gear blank production 300% by switching from bar stock to TIMKEN® steel tubing

AN engine manufacturer felt that his gear blanks were costing him too much to make. The center hole had to be bored out of solid bar stock. It took a whole hour to turn out 29 blanks. And a lot of steel was wasted in the process.

So the manufacturer discussed his problem with metallurgists of the Timken Company, experts in fine alloy steel. After study they recommended a change in production methods together with a switch to Timken® seamless steel tubing in place of bar stock.

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